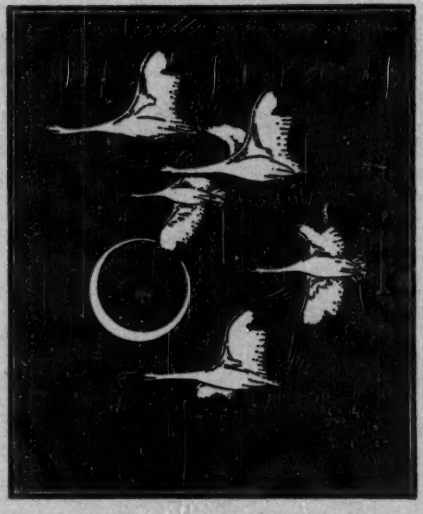
Nature Magazine

VOLUME 44 NUMBER 3



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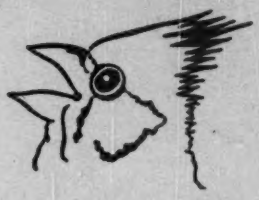

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Applications are already being received for the Yosemite Field School by Donald Edward McHenry, park naturalist and director of the school, Yosemite National Park, California. A maximum of twenty students can be accepted for these outstanding sessions of a workshop in interpretive methods. Average cost per person for the basic seven weeks of the school runs to $170. The alumni of the school are now numerous and scattered far and wide, many of them being in park work in either the Federal or State services. Full details may be obtained from Mr. McHenry at the address above.

Buffalo Salon

The 13th Annual International Exhibition of Nature Photography under the direction of the Science Museum Photograph Club of Buffalo, N. Y. will be held at the Buffalo Museum of Science from May 15 through June 10. Entries close on April 27. Photographers may submit a maximum of four color slides and/or 4 prints in monochrome or color. Entry fee is $1 for each section (prints or slides). The Exhibition will be conducted according to the recommended practices of the Photographic Society of America. For information and entry blanks write to: Ruth F. Sage, 49 Johnson Park, Buffalo 1, N. Y.

Writing for Children

Announcement is made of the annual Charles W. Follett Award, which seeks to stimulate more interest in literature for children among established authors and to discover new writers. The award totals $3000, and the age range of manuscripts submitted is between 8 and 16. It is to be hoped that an outstanding manuscript in the field of Nature or conservation may some day win this award. Full details are available to writers from The Charles W. Follett Award, 1255 South Wabash Avenue, Chicago 5, Illinois.

Le Vie del Mondo

From Alvise Zorzi, assistant editor of *Le Vie del Mondo*, comes word that the editors of that Italian publication are interested in articles on American zoology, botany, landscape and ethnography. Article length should be about 2500 words and the article should be supported by pictures. This publication is attractively printed, profusely illustrated, and worldwide in its editorial scope. The address is Touring Club Italiano, Corso Italia, 10, Milan, Italy.

Michigan Conservationists

Seeking to concentrate their educational program in connection with this year's observance of National Wildlife Restoration Week from March 25 to 31, the Michigan United Conservation Clubs will build their activities around soil conservation. Wendell Ball, chairman of M.U.C.C. conservation committee, will collaborate with Paul Herbert in following out this policy. Mr. Ball's address is Paw Paw, Michigan.

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BRITISH RAILWAYS

Nature in Print

By HOWARD ZAHNISER

AS MARCH hurries along towards us once more — March, the first month of the natural year's first season — it is good to have at hand such a book as Richard Headstrom's *The Living Year*. As a newspaper "nature columnist," a science teacher, a natural-history-museum staff member, Mr. Headstrom has come to know intimately the outdoor manifestations of his New England year, and it is pleasant indeed to have such a record as he has provided.

Mr. Headstrom has set down his observations in two fashions. For each of the months he has written an essay in that familiar and instructive literary form that we may know as the Nature calendar essay. To each such essay he has also appended a list of the natural events of the month.

For March Mr. Headstrom's list starts out as follows:

"Young porcupines may be born.

"Under the warm rays of the spring sun, the stiff catkins of the alders expand into soft, drooping tresses.

"Marsh hawks return from the south.

"Meadow mice begin to breed."

The list thus begun comprises some 55 such items in all. What a specific suggestiveness they do have for the armchair reader, with their simple brevity, these March items, and those in the others of the dozen such check lists that *The Living Year* affords! "Sap begins to run," says one terse item for March, and another reads simply, "Bills of the starling show touches of yellow." For individuals and groups setting out on excursions of observation in the region of Mr. Headstrom's experience, these lists should be both useful and stimulating. For all of us they are as spicy to read as the headlines. In January: "Raccoons mate." In May: "Bobolinks frolic in spring meadows."

Mr. Headstrom's dozen essays also are richly informative, being descriptive of the months rather than expressions of their author's lyric moods, although they are indeed to a great extent personal testimonies of first-hand experience. Thus he writes in a couple of representative sentences: "I know of no month that offers such a succession of delightful and unexpected surprises as March. On an early morning I might awaken to the gay carol of a song sparrow, as he voices his arrival in clear, ringing notes, and later in the day discover the starry blossoms of the spring beauty expanding in a sunny hollow or in the still naked woods the spring azure butterfly flying about like a 'violet afloat.' " So varied are the manifestations of Nature noted in *The Living Year*, and so simply and directly are they reported.

What a different sort of book is this bright-covered British volume by David Lack called *Robin Redbreast*, concerned, as its author and compiler says, "with unnatural, not natural, history." Its object, he explains, is entertainment, not the advancement of learning. "Many bird-books," he observes further, "are by townsfolk describing their holidays in the country, this one records the holiday of a naturalist indoors, in the library." Our author even comments that the subject of the book should not be thought of as its main theme "but rather as the excuse for a journey, a rambling journey through England, with frequent pauses to admire the view."

The subject of this book, a miscellany — a charming gift book—is of course the *British* robin redbreast. As the professor in academic cap and gown remarks to the longbearded savant by his side (in the cartoon from *Punch* that is among this book's illustrations), "A little *Erithacus rubecula melophilus* told me." Not, of course, *Turdus migratorius*, our North American robin.

Of our own robin, which is probably as familiar throughout our land as any other one species, Mr. Headstrom writes in *The Living Year*:

"A day or two after the bluebird appears I am sure to see the robin on the lawn or to hear his sharp clucking call from a nearby tree. For some reason the first robin of spring always seems to be alone, and yet a day or two later he may be seen in company with several others as if they had been close at hand but timid about showing themselves. But this explanation seems unlikely, for the robin displays a most charming confidence in the friendliness of man and walks unconcernedly about our lawns in search of worms. Frequently his trusting nature leads him to build his nest and rear his family on the woodwork or in the vines of a porch within a few feet of a window or door. It may be days before the robin bursts into song," writes Mr. Headstrom in concluding this brief sketch, which is typical of his volume, "but then some early morning his simple song of faith and hope falls on our ears."

Our bird's "charming confidence in the friendliness of man," as well as its ruddy breast, has certainly entitled it to bear honorably enough the name of the British robin. But they are indeed different creatures. The British bird is, notably, no harbinger of spring, but rather, is most decidedly a winter companion of its fellow English inhabitants. Mr. Lack makes a telling point on this theme:

"Only in Britain," he writes, "is the species *Erithacus rubecula* commonly known by a nickname. . . The reason seems clear; only in Britain is the robin habitually tame. Now," Mr. Lack explains further, "this tameness originates in winter, and in the northern parts of the Continent the winters are too severe for the bird to remain, while in the southern parts it has good reasons to avoid mankind. At the season when Britons are feeding robins, robins, alas, are feeding Frenchmen, Italians, and others. The robin's place round the English homestead, and hence in English literature, is due to a happy conjunction of mild winters and kind hearts."

It is with the robin's place round the English homestead and in English literature that Mr. Lack is concerned in this charming and entertaining volume, which includes both an anthology of the many things that have been written about (or so as to include) the robin, and also a series of introductory topical essays to the various groupings of its miscellanies. We shall have to bear it in mind when Christmas time next approaches and seek an opportunity to discuss it again. Now it may suffice to call attention to the book and to note that, despite emphasis on the robin as an English winter friend, this bird is likewise a songster of the spring, and Mr. Lack's collection includes the fine spring verses that William Wordsworth entitled "To My Sister:"

It is the first mild day of March;
Each minute sweeter than before,
The redbreast sings from the tall larch
That stands beside our door.

How Lovely Seasons

By ARCHIBALD HOWARD

How lovely seasons are! How good to know
The gust of life with each returning spring!
The blooming flowers, the songs that birds bestow
Are precious joys that make us also sing.

We see these lilacs, fragrant, sweet, today,
And know anew a fragrance all our own.
We hear the robin to his mate, and say,
With truth and thanks, our own love too has grown.

A generation's life we share each year,
And still live on. No season's pride are we.
Perennially the earth's good atmosphere
Is ours, and our love grows eternally.

Returning love expresses life that stays,
And we may always life . . . forever praise.

There is a blessing in the air,
Which seems a sense of joy to yield
To the bare trees, and mountains bare,
And grass in the green field.

This blessing in the air and the sense of joy it yields are certainly among the perceptions of the readers of Roderick L. Haig-Brown's *Measure of the Year*, for here (it seems to me) is one of the rare books of power — a work that is not only formative and entertaining but also inspiring. As Mr. Headstrom informs us pleasantly, as Mr. Lack entertains and delights us with his poetry, stories, lore, and the quaint illustrations of his robin, so Mr. Haig-Brown seems to communicate a measure of wisdom (if this can be communicated) and to share with us a power that he has derived from his living. His book, too, is arranged in twelve parts, each introduced with a brief essay on its month, but thereafter in each case telling of Mr. Haig-Brown's experiences and those of his family and community, and of his thoughts. As Mr. Headstrom looks about and writes a descriptive book that is well entitled *The Living Year*, so Mr. Haig-Brown, writing reflectively and subjectively, might well have called his work "A Year of Living." It is a book with a vitality, such as I can not recall having felt in a book since reading Elliot Merrick's *Green Mountain Farm* two years ago.

From his British Columbia home in the town of Elkhorn, Mr. Haig-Brown — who is by profession a writer of books — writes this book "to show a family trying to live out a sensible and positive life in the twentieth century." It is his own family — himself, with his wife and their three daughters and a son. It is their way of living that is the subject of the book, but running through it is a theme that brings the book to our special attention on this page. That, in Mr. Haig-Brown's own words, "is the account of natural life and changing seasons carried by the 'month' chapters, a thread that strengthens and supports and gives depth to the other."

"The great clear signs of the changing seasons," writes Mr. Haig-Brown in his note on March, "the migrations of geese and salmon, of caribou and buffalo, the swell of leaf buds in spring, the first fall snow on the high mountains, have meaning beyond themselves and a power of association that must go far back into the earliest development of man. . . .But for every one of these," he continues, "there are a thousand lesser signs, persistent in their multiplying variation from year's end to year's end and through all the seasons. Some are signs of changing season, some of progressing seasons, some of nothing more than their own change and growth. There is little concrete reason to watch them, yet men have always watched them, often with intense pleasure, and many men have thought it worthwhile to record them minutely and faithfully."

This we have here witnessed in Mr. Headstrom's records of *The Living Year*.

"Observation of this kind," Mr. Haig-Brown reflects, "holds its own satisfactions and lively triumphs; it is full of surprises and rediscoveries, of new sensations and sensations renewed.

"By themselves," he recognizes, "these would be enough.

"But over and above them all," he points out in an interpretation that suggests well the excellence of his *Measure of the Year*, "is the sense of participation in the world's real life."

Near the end of his volume he writes similarly in another connection: "I want at least the illusion that I have a place and part in the natural world, some measure of power and freedom to supply my own needs, to protect my own and instruct my own. I want to go on believing it is worthwhile to search for purpose and plan and meaning in everything about me."

Reflecting on this comment and, in conclusion, on the added interest there is for us in the outdoors because of the seasons, I am led back to David Lack's *Robin Redbreast* and its quotation of Samuel Taylor Coleridge's "Frost at Midnight," which I here copy — with thanks that it included the reference to the redbreast that qualified it for this book:

So shalt thou see and hear
The lovely shapes and sounds intelligible
Of that eternal language, which thy God
Utters, who from eternity doth teach
Himself in all, and all things in himself.
Great universal Teacher! he shall mould
Thy spirit, and by giving make it ask.

Therefore all seasons shall be sweet to thee,
Whether the summer clothe the general earth
With greenness, or the redbreast sit and sing
Betwixt the tufts of snow on the bare branch
Of mossy apple-tree, while the night thatch
Smokes in the sun-thaw; whether the eave-drops fall
Heard only in the trances of the blast,
Or if the secret ministry of frost
Shall hang them up in silent icicles,
Quietly shining to the quiet moon.

The Living Year. By Richard Headstrom. New York: Ives Washburn, Inc., 29 West 57th Street. 1950. 256 pp. (5½ by 8¼ in.) with 14 drawings by Anne Marie Jauss. $3.

Measure of the Year. By Roderick L. Haig-Brown. New York: William Morrow & Company, 425 Fourth Avenue. 1950. 260 pp. (5¾ by 8⅝ in.) $3.

Robin Redbreast. By David Lack. Oxford: At the Clarendon Press. (Oxford University Press, 114 Fifth Avenue, New York 11, N. Y.) 1950. 224 pp. (6½ by 8⅛ in.), with illustrations in the text from old sources, 8 plates (7 in color), notes, and indexes of persons and places, birds and other animals, and subjects. $4. (A beautiful volume!)

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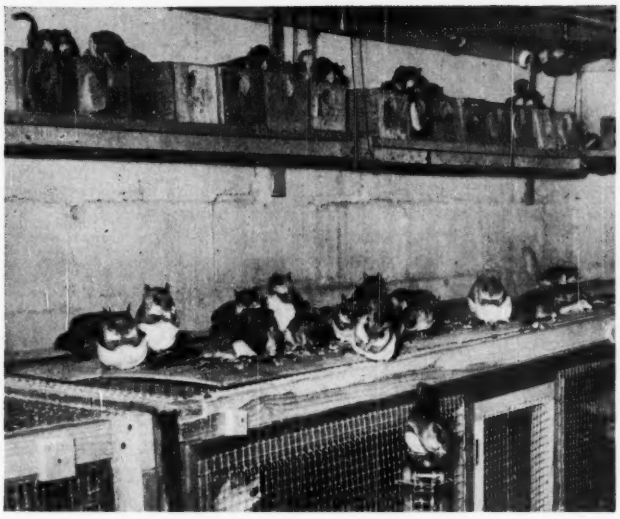

Flying Squirrels

Probably we should have anticipated it, but our features on flying squirrels in the February issue of *Nature Magazine* stimulated a quick demand for these appealing little animals as pets. We are often not too keen about such ideas, fearing that the initial enthusiasm may wane and that the animals may be neglected. Furthermore, we are not interested in stimulating people to go out and catch the squirrels. However, most of the inquiries came from people who seemed to have had experience with pets and the intention of caring for them properly. We were left, therefore, with the problem of answering the question as to where squirrels could be obtained.

We found the answer right under our noses. In nearby Arlington, Virginia, we discovered L. E. Greeson, a Government employe who loves flying squirrels, has raised a great many of them in captivity, and is able to supply them to the proper people at a reasonable price and under the best possible conditions. Above is a picture of some of Mr. Greeson's well-kept and happy flying squirrels, more of the little animals than we ever thought could be seen in any one spot. So anyone interested in such pets can write to L. E. Greeson, 905 N. Monroe Street, Arlington, Virginia. He will decide whether the inquirer is the sort of person to which one or a pair of the little animals can be entrusted. He provides detailed information on their care. We are glad we found Mr. Greeson.

Birds in Minnesota

Where to Find Birds in Minnesota. Compiled by Kenneth D. Morrison and Josephine Daneman Herz. St. Paul, Minnesota. 1950. Itasca Press. 122 pages. $1.50.

This is a guide to sixty-two birding areas, parks and sanctuaries in Minnesota, and is actually a collaboration on the part of a considerable group of bird enthusiasts whose contributions have been organized by the two collaborating compilers. It is a sort of Duncan Hines or A.A.A. guidebook to the birds of the State. The book is divided into four sections, each of which includes reports for birding areas within certain boundaries. A map is provided for each section, followed by a list of communities and the places in or near which bird watching should be most resultful. Each of these promising spots is then described in detail by one well acquainted with it. Directions for reaching the spot are given, the area described, vantage points indicated and even hazards pointed out. So far as we know this is a unique approach to birding within a State, and anyone in or visiting Minnesota, armed with this and Peterson's *Field Guide to the Birds*, should be able to compile a most imposing list of birds seen.

Romance in Nature

Dragons in Amber. By Willy Ley. New York. 1951. The Viking Press. 328 pages. $3.75.

"Further Adventures of a Romantic Naturalist" is the subtitle that the author gives to this latest of his books, which reflects Willy Ley's special preoccupation with the obscure, elusive and unique in Nature. His earlier volume, *The Lungfish, the Dodo and the Unicorn*, set the pace for this present book, which deals with strange and interesting stories of both fauna and flora. His chapters delve into stories ranging from the land of the panda and the rediscovery of the *Notornis* to the forest environment of the dinosaurs among the ancient sequoias and cycads.

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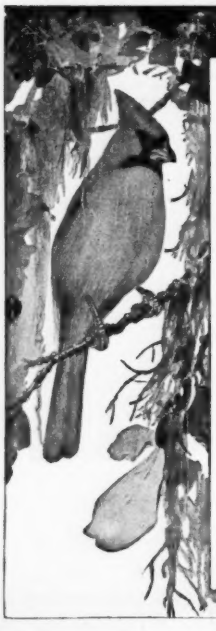
THE MILWAUKEE ROAD

By Way of Report

FOR A quarter-century Dr. E. Laurence Palmer, Professor of Nature and Science Education at Cornell University, has served as Educational Director of the American Nature Association. The Association has also worked with Dr. Palmer by providing funds for conservation fellowships available to graduate students going into the conservation education field, and the educational results of this have been like the expanding ripples on a pond when a stone is thrown into it. Now Dr. Palmer adds another responsibility, that of Educational Consultant to the Committee on Conservation Education of the National Wildlife Federation. His task is to aid this committee in proposing and carrying into effect larger and wider general policies in the field of conservation education.

CONSERVATIONISTS are being alerted once more to the danger of another drive by livestock interests to gain control of grazing lands owned by the Federal Government in the West. The move this time is apparently being framed more subtly than was the case with the bold attempt made in 1947. Conservation groups, including the American Nature Association, joined to thwart the earlier attempt and were successful. They were applauded by fair-minded westerners who resented the bare-faced land grab attempt by a few. This time the grab will be less obvious and will be cloaked in legislation that looks good on the surface and seeks to propitiate certain groups that were antagonized before. The forthcoming proposals would completely undermine the grazing policy of the U.S. Forest Service and result in an eventual grab of other Federal lands. We will keep our members advised.

WHILE extensive studies of hunting pressure on mourning doves continues, and calls for closed seasons increase in parts of the South where decreases in the number of birds are alarming, Guy Atherton of St. Paul pursues his battle for the doves. Having succeeded in getting the birds year-around protection in Minnesota, this sincere conservationist turned his attention to Illinois, with the same object in mind. Although a bill closing seasons on the doves in that State was killed in legislative committee in 1950, it did focus attention on them and their plight. A new drive for protection will be made this year with hope of greater success. Mr. Atherton heads the conservation committee of the St. Paul Audubon Society, devotes much of his time to this work and can use contributions earmarked for the dove drive alone. Funds will be used for educational material, printing and mailing, and contributions may be sent to Marvin H. Adams, Treasurer, St. Paul Audubon Society, 1808 Portland Avenue, St. Paul, and marked for "Conservation Fund."



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Contents Noted

"GADDY'S GEESE" was the title of a feature article in our November, 1948, issue. It was the story of Mr. and Mrs. Lockhart Gaddy who built a farm fish pond on their property near Ansonville, North Carolina, so that Mrs. Gaddy's aged mother could fish close to home. In 1937 some Canada geese dropped in to the pond and stayed. The next year more came, and each year more, until the pond had to be enlarged and the guests numbered some five thousand birds. The U.S. Fish and Wildlife Service helped Mr. Gaddy by supplying some food to supplement what he could afford himself. When the Service withdrew this aid, Mr. Gaddy was forced to charge adult visitors, many of them tourists, twenty-five cents admission. This helped, but the income was far short of covering the food needed. Children were never charged and they came in busloads from many schools. A guest book was supplied and the youngsters were eager to register their names in it as a record of a stimulating and educational experience. Fewer adults registered. Then, a short while ago, agents of the Federal Bureau of Internal Revenue, Greensboro, North Carolina, office, descended upon Mr. Gaddy. He had not paid the Federal tax of twenty percent upon admissions. The host to the geese had no record of the intake in quarters; it had all gone for bird food. The agents looked at the registration book with its lines of children's names, did some rapid calculation on the basis of this, and came up with an assessment of $2800 in taxes due from Mr. Gaddy, who does not have the twenty-eight hundred.

WITH many others, we got a certain inner satisfaction from the news story from London telling of the 15-year-old who took rather direct action to free from the London Zoo more than five hundred dollars' worth of birds. Brought into court, it was testified that the boy liked to draw pictures of animals, although he was not good at it. He failed as apprentice to a taxidermist because he liked animals alive. A job in a pet shop blew up because he liked animals free. Teachers said he was a rather dull boy, although animated by some "inner fire." This must have been true, for he acquired some cutting pliers and used them on the cages of the birds in the zoo. Water birds he carried across London to St. James Park near Buckingham Palace, freeing them in its friendly waters. Others he just let take wing. Involving birds of such value made his act a crime; grand larceny, in fact. Although we looked carefully, we never saw a sequel to the original story, which left the young man on bail. Certainly his direct action in this case should hardly be encouraged by open applause, any more than the action of the Philadelphia boy who loved snakes and helped himself to some fine ones from the Philadelphia Zoo. Nevertheless, we cannot put in with the estimate of his teachers that he was a dull boy. As we all have more reason to ponder than ever before, freedom is a mighty wonderful thing, and it takes an inner fire to be willing to sacrifice for it.

WHEN Roger Tory Peterson, famous artist-author-naturalist, was a boy in primary school in Watertown, New York, one of his teachers was Miss Hornbeck. She recalled later that Roger was not always the most attentive boy in class, or the most concerned about his studies. However, he seemed to have an inborn interest in birds, an enthusiasm his teacher shared with him. They took bird walks together, and this experience helped to spur the young ornithologist on to the high position he holds in the world of ornithology today. At the recent meeting of the American Nature Study Society in Cleveland, Grace Maddux of the Cleveland schools learned that Miss Hornbeck was living in that city. So quietly she arranged for Miss Hornbeck to be present at the annual dinner of the Society. At the head table the teacher and the student sat side by side and exchanged memories of Watertown, and its birds as they knew them together.

WITH the annual meeting of the American Nature Study Society, held in conjunction with the annual sessions of the American Association for the Advancement of Science in Cleveland in December, we completed two years as president of the A.N.S.S. Elected a director of A.N.S.S., we will continue as chairman of its conservation committee.

AFTER reading our comments, on this page in the January issue, with respect to the sale in Brussels, Belgium, of song and insect-eating birds, dead and alive, Marian D. Morton of Toronto kindly reminds us of the most appropriate poem by Ralph Hodgson entitled "Stupidity Street." This is the poem:

"I saw with open eyes
Singing birds sweet
Sold in the shops
For the people to eat,
Sold in the shops of
Stupidity Street.

I saw in vision
The worm in the wheat,
And in the shops nothing
For the people to eat;
Nothing for sale in
Stupidity Street."

Certainly this is a most effective summation of the importance of insectivorous birds. Translated into French and Italian, and widely circulated in those European countries that lag so far behind in bird appreciation, these lines might well do a great deal of good.

R.W.W.

"Then, without fail, would come a thump on the snow-drifted floor as a furry kite came gliding down between the moon-silvered columns of the porch."

Phantoms of the Winter Night

By JOHN LINDSEY BLACKFORD

Photographs by the Author

The little flying squirrel peeks from the entrance of the shelter nest.

IT WAS during the Winter of the Long Cold that they came. Hunted and hunter they were — two small dark adventurers gliding down amidst the black pillars of the forest, and the third, a white presence, almost unseen, even upon the silvery diamond-sheen of the moonlit snow. Each, like a furtive thought, might have been only a shadow glimpsed or imagined during the Long Shadow that was each midwinter night. The dark pair were revealed as a flying squirrel and his shy mate. The white phantom — told by instant vanishings and swift, serpentine streaks in the moon-blotched blue-blackness — was a white ermine.

The January cold, heralding weeks of unremitting below-zero frost, had already gripped the enclosing forest for a fortnight when first I grew aware of them. Long after lights were dimmed and radio music seemed softly to defy invading chill, a scrambling would come at the window bird-shelf. Hours before, stuffed but shivering chickadees had fled to tree-trunk shelter nests. The dark little newcomers did not reach the feeding station on wings, yet at the least movement within they were gone with such blurred swiftness as to suggest the power of flight. Then late one evening the searching shaft of my flashlight momentarily "froze" one small stranger as he tussled with rock-hard suet on the window shelf. It was then I knew my visitors were flying squirrels!

While pine squirrels retreated to snug deer-moss nests to wait out the relentless cold, and chipmunks lay wrapped in months-long slumber beneath the deep snowy blanket, flying squirrels were braving searing frost to romp in the steely starlight and glide giddily down the black forest aisles. By Nature's pattern it was logical that they do so. For if they fled the long, bitter nights of winter, what chance in the brief, pale night-dusk of northern summer would these nocturnal sprites ever have to live? Even north of the Arctic Circle these furry aerialists do not hibernate. Yet in cold that now clutched at every stricken breath, that penetrated fiercely in toward each struggling heart, what miracle that any living thing dare venture forth at all!

It was February — when deep powder-snow heaped to several times its former depth, and unceasing cold held many times its early menace — that I felt certain the two flying squirrels were mates. Dim moon-glow had first revealed her. She was darker, slighter, much more afraid than he. She risked adventure seldom, even then clinging close by his side, seeming almost his shadow on these still shadowless nights. When light stabbed the dark, she fled like a frightened wraith.

As the frosty moon waxed bigger, brighter each night, the Long Cold pressed in. Silvered evergreens huddled together, bulky and still under scintillant burdens. Dark birches were crystal trimmed. Towering conifers stretched lengthy shadows across the hillside, so dark as to seem like huge, black crevasses in the mantling brilliance of the snow.

The creak and snap of heaving house timbers, the pistol crack of frozen tree trunks splitting out there in the close-crowding woods, alone severed the silent chill. Then, without fail, would come a thump on the snow-drifted floor as a furry kite came gliding down between the moon-silvered columns of the porch. Then a scrambling at the window shelf. Soon a lengthy gnawing followed, or again, instant flight.

I was tormented by the urge to secure photographs of this wild little phantom of the winter night. His regular return for suet and raisins to the spot I might select was a constant challenge. And there were those elfin tracks on the snow-drifted porch, proving him more than an illusion of the moon-paled dark.

But as relentlessly as the increasing cold clutched the frigid forest outside with icy grasp, so week after week the flu gripped me. I tried the exacting work of placing a camera set one night in mid-February; then the hours-long vigil, waiting and ready each moment for the lone chance that might come. Once he was there in the wan moonlight, just a darker shadow among deeper

As the frosty moon waxed brighter, forest shadows lengthened across the mantling brilliance of the snow.

ones. But the only result of sitting up so long was to lose my interest in the squirrels for a week.

Yet there was something I could do — "condition" my visitor to the light. He was no longer afraid of the dim lamp within. The porch light high overhead would disclose the little flyer when some night later on he reached the camera set; and would then tell me when to trip its flash upon the nocturnal sprite.

It would be best to begin now when already his white world out there was lit by the eerie half-light of the full-round moon.

Another evening's chill, foreboding dusk brightened to white and silver under the moon's swift-rising disc. And just as surely from blue-black shadows glided the night's adventurer. A hasty scurry and climb. A steady gnawing at the shelf. The light snapped on. I saw a furry streak pitch down from the window ledge. Even in that brief leap the small glider's furry "wings" were spread, to be furled swiftly as feet gathered for quick landing and the bounding race off through the soft fluff of new surface snow.

But, strangely, the flying squirrel returned that evening. The sudden, repeated light, now merely accenting the moon's brilliance, only sent him reluctantly to the shelf edge. As quickly, he darted back to the suet — nonchalantly to accept those illuminating interruptions for the rest of the winter.

The white phantom I had only guessed to be out there. Chiefly it was the instant departures, the clinging fear of his mate, the trigger reflexes of my little visitor that told of the Other One. And, once or twice, before the ever-falling flakes had covered it, a long, leaping, wisp-like trail in the snow.

At last one night, when arboreal shadows sharply cut the argent whiteness into fantastic patterns, he was there — the ermine!

I had sensed a movement upon the feeding table. A moment before there had come the thump of the little aeronaut sailing down from a fir trunk to land and scuttle across the porch. I watched him climb to the table top. But when light flooded the snow-trimmed table it was the weasel that lurked there, right where the squirrel had been! But his prey was gone, as swiftly as darkness had fled before the light. And the ermine, baffled but alert, fearless in the sudden glare, dropped to the track-littered floor, posed an instant like the embodied spirit of that fierce winter night, and then seemed to dissolve into the surrounding white.

Among neighboring forest boughs and tree trunks my aerial visitor was safe. Any pursuit there by the little White Marauder brought a race to the treetop, a swift launching out into space, the long glide down to distant birch or evergreen. Beady, glittering eyes and needle teeth of the sinuous hunter were left behind. But flight from the porch meant frantic, heart-bursting bounding back over the soft, treacherous powder-snow. How could the flying squirrel return to face the ever-likely presence of the lithe little enemy there across the treeless border of the lawn? It was food — life itself in the frozen world out there — that brought him back.

His vigilance, his own instinctive lightning-like reactions, developed through a million years of pursuing and escaping by furry flyers that had escaped, and endowed him with them, were his protection. The ermine might be lurking there, but the dark little adventurer would come again. On the table where light had revealed the hunter there was also food.

How many times the wide-ranging weasel slipped among the porch shadows I do not know. Nor could I surmise how often he tired of haunting the deer mice whose lacy trails embroidered each new quilt of the snow, whose fragile lives gave up but a drop or two of hot, bright blood; or how regularly he returned seeking the larger prey. Only once there in following weeks did I capture another fortunate glimpse of the diminutive white phantom.

It was during the depths of extremest cold. Five days and nights of penetrating, Arctic frost had slowed

The little furry flyer twirled and ate his raisin from the supply at the feeding tray with his usual efficient gusto.

at last the movements of the flying squirrel. For the first time he huddled at the suet, balled in the fluff of his silken fur, numbed it seemed by the very weight of the cold. His quick little paws were a bit uncertain, his banner tail lacked its graceful bow. Then, like the instant kindling of a spark, his agility returned and he was not there!

Presently in the sparkling square of white beneath, cut from the night by the window-glow, I was aware of the weasel. Even that congealing, forty-below cold had not slowed or dulled him. Sleek, poised, his movements like rapier thrusts, he was still the perfect killer. He had to be to live! To small winter woodfolk he was omnipresent, certain, relentless, the perfection of swift death. For a moment I marked the weasel against the diamond-sparkle of crusted snow. Then he too was not there.

That months-long cold broke with the end of February. Then weeks of thawing. Yet, with the constant drip and melt, the wet wreaths of mist curling among the birches, and the thudding rains, snow still lay deep through the forest at the close of March. Now with warm, almost balmy darkness, it would soon retreat from the valley. There were but a few more nights when the flying squirrel would be certain to return. And at last I could attempt the camera set.

It was waiting there when my nocturnal visitor came in the pitchy darkness of late evening. A familiar thump and scurry, a dusky streak across the window glare, and he had reached the raisins. As usual he scarcely checked the twirl of dextrous paws when the overhead light flicked on. There was comfort now in feasting. The enemy Cold was gone; and he could match agile leaps with other killers for short distances.

His pose was perfect. Sitting up facing me like a pine squirrel with a cone, or a gray squirrel juggling a nut, the little furry flyer twirled and ate his raisin with efficient gusto. The 1/400-second speed of the shutter would never "stop" the slight but twinkling motions of the feaster. A negative image with blurred paws would be worse than none at all, for such a chance as this might never return. His visits were brief. I waited . . .

A metallic rap on the window pane. A split second's pause of the paws. An instinctive jerk on the pull-cord.

The scene was already lighted so the camera-flash did not produce blinding glare. Yet there was that thousandths-of-a-second adjustment of vision before my eyes could again register events out there. The flying squirrel poised motionless for an instant, profile to lens, in the white intensity of light. He had turned! Had the film caught him in movement, just a blurred ball of fur, or had the shutter captured him in this second of frozen stillness before flight?

The profile would make an excellent photograph, if luck were greater than my hopes. I had not been so fortunate, I knew, to react to that first second's fraction of immobility. He had sensed unknown danger and turned with a wild thing's swiftness. One could only hope for a miracle of timing that had captured the adventurer of the dark in that last pose before flight.

It was darker after the flash. The little glider's de-

parture was too swift to leave even an impression of his race across the snow. I could only recount the instant's brilliant disclosure and wait for two weeks until I could attempt the film's development. What was the secret of that fragile emulsion?

There was no magic resolving of that anticipated image under the ruby glow of a darkroom safelight. This was fast panchromatic film. And that meant agitation of the negative in unseen developer for full five and one-half minutes during total darkness. Then a dip in the acid bath, and quick transfer to the fixer. Another long wait of minutes while I kept rigidly to schedule. At last the light . . .

A dazzled glimpse; the first thrill; closer scrutiny. Perfection! The flyer of the night was pictured there as seen an instant before the flash. Before any movement! The outline, the paws, even the elfin whiskers were sharp, needle-sharp! For once reaction had been as swift as thought.

* * * *

There were no wrens in my wren box this last summer. Instead, a pair of flying squirrels drowsed out the sheltered heat of long, glaring July days there. Was it *his* flat, fluffy tail-tip that curtained the wren-box door?

★

Respect the Mountain Laurel

By EDWIN F. STEFFEK

One of our most attractive and most abused native shrubs is the mountain laurel, *Kalmia latifolia*. Reams have been written about protecting it, but not much done to date. However, real conservation means doing something to save our flora, and to increase it and make it grow where it has been destroyed, and in any place where conditions are to its liking.

This laurel grows well in sun or light shade, and was once plentiful from New Brunswick west to Ontario and south through the mountains to Florida, and even to parts of Louisiana. The most shapely plants and the most bloom, however, are produced in the sun. Mountain laurel is a shallow rooter and does best in an acid, leafmoldy soil with fairly good drainage. It is because of these shallow roots that it is so often torn up by careless picking and damaged by ground fires. For best results maintain a two or three-inch layer of pine needles, oak leaves or peat moss over the soil at all times. This guarantees a steady supply of moisture to the plant and eliminates any need of hoeing around the plants, which would damage the roots.

The leaves are dark green, glossy and attractive all year round, making the laurel an excellent subject for domestic as well as large landscape plantings. And if you do plant any, make sure yours are nursery-grown plants, not those robbed from some woodland.

Against the laurel's background of green are nestled the clusters of large, white or pink, cup-like flowers with trigger-like stamens that are released when disturbed as though springs were present.

As with most members of the heath family, the propagation of laurel is slow. It can be grown from seeds pressed into a mixture of peat moss and sand in a cold-frame or other place where the plants will not dry out completely. Another and faster way is to layer. Cut several notches a few inches apart and not more than halfway through the stems. Then bend the stems to the ground, peg them down and cover with soil. In a year or two there should be roots, and the stems can be cut off, thus making a number of new and entirely independent plants. Sometimes several plants can be made from one long stem.

So practice some active conservation, and if you want a few pieces for Christmas decoration you can have them with a clear conscience. In any case, judicious cutting — not uprooting — helps laurel. The plant then comes up from the base bushier than ever; but before laying a hand on any laurel, make sure it is your own, or that you have obtained written permission from the owner of the land on which the laurel grows.

How Sweet Is Your Maple?

By WILLIAM GILMAN

Photographs by Eleanor Gilman

ELEVEN and one-half months of the year, the little woman is "man of the house" and my job is to boss the outdoors. But come the middle of March, there is a sure sign of spring. I am allowed in the kitchen, where we bump heads over the same kettle, wave spoons and, in general, act like a couple of cooks spoiling the broth.

It is the first crop of the year with which we are busy, a crop that requires no plowing, seeding or weeding, for it is maple syrup, amber aristocrat of sweets.

I am not talking commercially about 5000 sap buckets and a crawler tractor to haul maple sap down to the "sugar house." I am concerned with the old-fashioned way of sugar-making — as American as corn on the cob, producing anywhere from one to ten gallons of syrup for one's own pancakes, waffles, cake icings and candy, with perhaps a few Christmas-present quarts to spare for sweet-toothed friends.

This is an age of growing specialization, and younger farmers do not know what they are missing in good living when they pass up the maple tree's free offering. The same tree also awaits the ordinary gardener. There is no syrup as satisfying as one's own.

Often, I decide there will not be spare time for the syrup stint this year. But then, after fidgeting through February, I am greeted by one of those March days, sparkling with sunshine after a frosty night.

"Sap must be running," my wife opines. She is late. I am already getting out sap-gathering containers. The crabbiest neighbor I ever had whistled while tapping trees. It is like a tonic to get outdoors ahead of the first robin and see winter surrendering. And it gives a man a chance to prove what he often feels but dares not express, that he could cook circles around any woman if he "had a mind to." But at maple syrup time he does not get a real chance to prove his point. The little woman is soon in the kitchen, sniffing, brandishing a big spoon and offering to help.

Ordinarily, she will buy any gadget that comes along, but my special thermometer and hydrometer make her giggle. Using only the spoon, she claims there is nothing more to making maple syrup than grape jelly. When the stuff "sheets," it is finished and will pass any eleven-pounds-to-the-gallon test. I still use the gadgets — to her face. Behind her back, I have learned to depend on the spoon.

The truth about syrup-making lies somewhere between a lot of romantic nonsense written in its praise and the "I won't try it again" school. Getting caught in a flood of sap from too much tapping is one common mistake made by the amateur. Another is to boil out-

Maple syrup-making can be outdoor fun for the amateur, who need not bother with any special buckets for catching the sap. A drive through New England in early spring will show trees sprouting every conceivable kind of container for sap, and the ordinary fruit canning jar is a favorite. On an ideal spring day one sap spout will yield between six and ten quarts of "maple juice."

doors over hissing wet or green wood. The fire may not get hot, but one's temper will.

A little old-fashioned know-how makes it easy. The tree in the yard, or beside the road, will do. In fact, the ordinary shade maple gives more and sweeter sap than the muscle-bound big fellows found in so many commercial sugar bushes. A medium-sized tree will handle two or three spouts, each averaging enough sap to make a quart of syrup. When the tree's buds begin swelling, it is time to quit.

The traditional "sugar" tree is the hard maple, ranging from New England down to Pennsylvania and to the mid-West, producing a quart of syrup from between 35 and 45 quarts of sap. But the soft maple will

do, and, just to prove I could, I have made syrup from birch and butternut trees. The hard maple is the favorite because its sap has more sugar, but syrup from other maples tastes just as good.

The spout made from a sumach twig will do, but it is easier to use metal ones from the store. Tapping is not anything more complicated than boring a hole with a 3/8-inch bit. Sap buckets are fine because of their large capacity, but ordinary canning jars do just as well when trees are near the house.

You will swear never again to try it if you boil much sap in the kitchen. The vapor will coat ceiling and walls. The main boiling should be over a kerosene stove, or its equivalent, out in the woodshed or garage, or simply outdoors over a wood fire with the shallow pan resting on stones, or an oil drum cut out to make a primitive stove. If an old-fashioned evaporating pan is not handy, a wash boiler will do.

There is nothing to do but boil and skim off the scum containing gritty niter, adding sap to keep three or four inches of liquid in the pan until you are ready to finish a first batch. The boiling goes on until there is a half-inch or so of concentrate in the pan. This is finished off to final syrup over the kitchen stove.

To get rid of remaining niter, strain through felt. An old-fashioned way to remove this gritty substance is to add white of egg, skim off what it brings to the top. The syrup is best stored at an even, cool temperature and will last for years, without fermenting, if it is canned hot.

Some like their syrup dark-brown and strong in maple flavor. In late years, for one reason and another, this has become Grade-C on the market. "Fancy" and Grade-A syrup is light-amber in color and with pale nuances of flavor. The darker syrup comes from later sap and from boiling larger batches. What to aim for is a matter of taste, and many pancake-eaters will take Grade-C and let others have the Fancy. Making it yourself leaves no room for argument; it is bound to be the best "maple juice" you ever have tasted.

Windshield Woe

By RUTH SEYMOUR VESELY

Pale insect, the landscape is less than Elysian
When blurred by your corpse on my angle of vision.
Entomologists *like* you, but that makes me scoff:
To me, you're a mess that I have to wipe off.

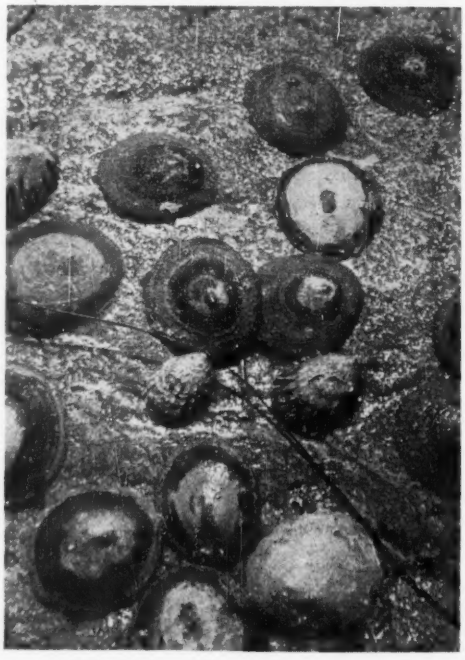
The Limpet *By* RUTH DUDLEY

ALTHOUGH many stories have been told of the uncanny power of dogs and cats to find their way home, across great distances, this unerring instinct never fails to seem remarkable. Even more amazing is the ability of a little sea animal, the limpet. This ordinary-looking, "one-shelled" mollusk, small as it is, can find its way back to its own tiny spot on a rock, often from quite a distance.

The limpet makes its home, generally speaking on some favorite rock, along with hundreds of other limpets. It picks out a spot and fastens itself there, firmly, with its "foot," or middle, muscular part of the body. And it can hold on, too, when danger lurks; so strongly that it takes a seventy-pound pull to get it loose. This is remarkable when one considers that the limpet's area at the base is only one inch.

The mollusk's food consists mainly of vegetable matter, which it scrapes from the rocks with teeth so tiny that only a magnifier will show them up. Since this food is not easily found, the limpet must often roam over a great many rocks to feed.

But no matter how far it goes, it will find its way back, not only to its own home rock but to its own private spot on that rock. This spot, by the way, grows, after a while, to look like the limpet — it spends so much time there. It often becomes scarred to the shape of its body, showing peculiarly limpet markings.



Takahe Valley, where *Notornis* nests in the snow grass of the foreground and around the shores of the mountain lake. Below, the bird on the run.

Notornis Is Found

By L. E. RICHDALE

Photographs from Department of Internal Affairs of New Zealand

IN THE southwest corner of the South Island of New Zealand is a vast area of monutainous country. Much of this region has certainly never seen a white man. and, probably, not even an old time Maori. No one knows what wildlife treasures lie hidden within its confines. Great possibilities of discovery await those with a Nature interest and adventurous inclinations.

Such a person is Dr. G. B. Orbell, of Invercargill, the most southerly city in New Zealand. Spending much of his spare time away from his medical duties in parts of this little-visited area, he has always been on the lookout for some of New Zealand's "extinct" birds, such as the moa, laughing owl, native thrush, and *Notornis*.

On April 11, 1948, Dr. Orbell, on one of his expeditions, discovered footprints that had been made by a large bird. Taking careful measurements of the imprints, he submitted them to the authorities. They told him that the footprints were the marks of a heron. Dr. Orbell, however, is far too experienced a field man to have his ideas brushed aside by people who may have seen less of the field than he. Wisely, he doubted what he had been told, feeling sure that the prints were too large for a heron.

When the winter was over, Dr. Orbell organized a second party, and led an expedition into the area of the mysterious footprints. This time he was successful, for not only did the party see the *Notornis*, for the first time in fifty years, but some of the birds were actually caught and photographed. On November 21, 1948, the sensational news was flashed across the world.

Prior to 1948, only four specimens of *Notornis* had been found, the first one being discovered in

1849 near Resolution Island on the southwest coast of the South Island of New Zealand. Some Maori sealers, noticing the trail of a large and undetermined bird on the snow, followed the footprints until a *Notornis* was sighted. Dogs accompanying the Maori sealers immediately gave chase and caught the bird, which was taken on board the ship. After having been kept alive for three days, the bird was killed and eaten by the crew. Fortunately, the skin was preserved.

In 1851, a second bird was caught by a Maori, and, in this case also, the skin was preserved. These two skins found their way to the British Museum. Nearly thirty years elapsed before a record was made of a *Notornis* again having been seen. In December, 1879, a rabbiter's dog ran down a large bird, and the rabbiter killed the bird and hung it on his tent pole. Next day the station manager happened to visit the camp, and, on seeing the bird, happily had some idea of its significance. Lifting the dead bird from the tent pole, he took it away with him. Later he skinned it and preserved the bones. This specimen was finally purchased by the Dresden Museum for 105 pounds. On August 7, 1898, a Mr. Ross was walking along the shores of Lake Te Anau, when his dog suddenly darted into the forest and shortly afterwards emerged with a large bird in his mouth. Although the bird was not quite dead, it died in a little time, as a result of rough usage. Recognizing the possible importance of this bird, Mr. Ross rushed it off to Invercargill for identification. It proved to be *Notornis*. The skin, bones, and internal organs were all preserved and described. Later, the skin was purchased by the New Zealand Government for 250 pounds and was deposited

Notornis **creeps through the snow grass, and, at the left, approaches its nest, in which are only two eggs.** ***Notornis*** **is a large, flightless bird allied to the gallinules but living entirely in grassy meadows. It is not equipped for swimming and apparently never enters the water. It was described by Sir Richard Owen about the middle of the 19th Century. The birds lately found included a chick, still in its jet-black down, and with conspicuous wing spurs.**

in the Otago Museum. For nearly fifty years visitors to the Museum have gazed on this preserved skin, regarding it as the last of its species, until Dr. Orbell's sensational discovery in November, 1948.

After the announcement of the re-discovery of *Notornis*, enthusiasm ran high in all sections of the community. The press of the country took up the cudgels on behalf of the remaining birds and urged the Government to do everything possible to see that they were not molested. The subject of the preservation of *Notornis* was discussed in Parliament, and legislation of a protective nature was quickly passed. The law now provides that only people concerned with the protection of the birds are allowed in the area; a wise procedure. Several official parties have been into the region in the hope of learning something that may help in the preservation of the species. At first the total population was estimated at one hundred individuals, but official reports are now not so optimistic, the estimate having been reduced to no more than twenty individuals. The personal opinion of one officer, who has spent considerable time in *Notornis* country, is that there are only twelve adults and one chick. Whatever may be the true count, it is obvious that the number is small and that great care will have to be taken if the *Notornis* is not to join the ranks of such extinct birds as the passenger pigeon and the great auk. Many people hope that the publicity surrounding the rediscovery of the bird will not result in the beginning of the end of *Notornis*. The greatest danger to the perpetuation of the species may not be stoats, deer, or dogs — but man, who has been the greatest destroyer.

Louisiana Water Thrush, or Water Wagtail

By GEORGE A. SMITH

Few birds are as particular in the selection of a nesting site as the Louisiana water thrush, or water wagtail, as it is commonly called. This little brown warbler wears a light colored breast streaked with black, and a white line over each eye. It always prefers to place its nest along the bank of a cool woodland stream that flows rapidly through a shaded ravine.

One evening in early May as I was hiking along the beautiful Octorara, a small branch of the Susquehanna River, in southeastern Pennsylvania, I suddenly came upon a pair of Louisiana water thrushes that gave out alarmed evidence that their nest was nearby. After a brief search along the bank of the stream, I found the nest shown in the photograph. It was placed on a narrow ledge of clay about three feet above the level of the water, and was concealed from view by an overhanging curtain of matted roots, soil and moss. The cup-shaped nest, built of grasses and rootlets, was supported by an elevated foundation of large, flat leaves, which extended well beyond the area covered by the nest. This extension of leaves served as a doormat on which the parent birds placed their dainty pink feet while caring for their young.

In searching for food, the Louisiana water thrush justifies its common name of water wagtail because it walks, swims and flies from one wet rock to another teetering its body like a sandpiper as it moves along. Its food consists principally of fresh-water larvae.

The song of the Louisiana water thrush, frequently heard during the nesting season, is a series of three wild, ringing notes terminating in an odd jumble of odd-sounding discords. The alarm note is a metallic chip.

In summer the Louisiana water thrush ranges generally from New England to the southern Carolinas, and as far west as Nebraska. In the winter it seeks the warmer climate, extending southward from Mexico to Colombia and the West Indies.

A close relative of the Louisiana water thrush, with similar habits, is the northern water thrush. This species ranges farther north and has a yellow eye-line.

Irish Furze in Oregon

By EVALYN SLACK GIST

THREE quarters of a century ago an Irish Lord by the name of George Bennett came to the Oregon coast and settled near the tiny hamlet of Averill, renaming it Bandon for his native town. He purchased a home bordering great sand dunes near the ocean. Before long he noticed the dunes were encroaching upon his property. He tried to stop them by various means, meeting with little success. Finally he recalled a dense, thorny shrub with yellow pea-like flowers, called Irish furze, that grew in his native Ireland. While visiting his old home a few years later, he gathered several pounds of furze seed. When he returned to Bandon, he planted them near the base of the offending dunes.

In sowing those few seeds, Lord Bennett sowed the greatest plant pest Oregon has ever known. What started out to be a modest hedge that would hold the sand dunes in place, has become the curse of that coastal area. Not only has the furze spread over the Bandon sand dunes, it has invaded the fertile land of three adjoining counties and may now be found many miles inland. It grows as a stubborn, thorny thicket along the banks of streams and over more than a thousand acres of tillable land. It has gobbled up valuable Croft lily land and cranberry bogs. Much fine grazing land has also been taken over by the furze.

Irish furze grows five to six feet in height, and forms a thicket so dense that it is well nigh impenetrable by man or beast. Long, needle-like thorns, even on young plants only a few inches in height, will pierce the thickest clothing or toughest hide.

Strong coastal winds and birds, carrying the seeds for considerable distances, are largely responsible for the plant's extensive spread. In early spring it yellows the sand dunes along the highway, attracting tourists who gather seeds and sprays, little knowing a pestiferous growth will start wherever they are planted.

When I visit the coast early in February, after Irish furze has just begun to put forth great feathery clusters similar in appearance to yellow Scotch broom, it is difficult to remember its evil habits. As the season advances, acre upon acre provide a golden sea of blossoms, kept in almost continual motion by strong winds off the Pacific. It is at this period that the tourists enthuse over it.

The furze burns readily, even in winter when a brief sun has partially dried it out. A furze fire spreads explosively yet does not kill the shrub. New shoots come up from the roots, and the tougher stalks left standing sprout new foliage. To date, the only known means of complete destruction is by grubbing it out, roots and all, with a bulldozer. Chemicals have proved to be of little or no value. Seeds have been known to lie dormant for twenty years and then spring into life. During warm weather, when the pods are filled, they often burst and scatter seeds for twenty feet. If a wind happens to be blowing, the distance is even greater. Since it is a proved fact that the seeds eventually sprout wherever they land, it is easy to understand how the Irish furze has continued to spread so thickly. First known, rather affectionately, as "Bennett Bush," it is today called Irish hedge, Irish thorn and by a score or more unprintable names. Botanically it is *Ulex europaeus*. It is also naturalized in other parts of the United States.

One of the most disastrous fires in the history of Oregon may be traced directly to this siren shrub from across the sea. This blaze, which occurred about twelve years ago, started out as a mere slash fire — lumbermen burning debris after logging (Continued on page 162)

When in bloom the Irish furze makes a lovely sea of yellow waving in the wind, but the wind also spreads the seeds of this spiny plant pest, which has spread its range widely.

Brook, falls and gorge — a waterfall declaims the whole vagabonding tale of water; Energy at the endless task of creation.

Nature Photography for My Sake

By JOSEPH. R. SWAIN

Photographs by the Author

A FRIEND once asked George Mallory, who lost his life in the last British effort to conquer Mt. Everest, why he insisted upon climbing the world's highest mountain. He answered simply: "Because it is there." To those who have experienced the call of even far lesser peaks than the giant of the Himalayas, that is answer enough. Something in that mountain spoke to Mallory's spirit, and would give him no rest until he had given his life among its crags and glaciers. For his own spirit's sake he had to climb Everest!

There may be many reasons for choosing Nature as your field of photographic interest. Once a New Hampshire farmer friend, watching me photograph a bee visiting one of his squash blossoms, asked: "Ain't it true that Nature pictures sell better than all others?" I answered: "I don't know; I never tried to sell any pictures." Up to that time it had not occurred to me to seek a market; but I have learned since that some Nature pictures will sell, and that there are even a few hardy souls who make their living by Nature photography.

Up our street lives a man who frequently goes fishing, but he never eats fish. He hands anywhere from ten to fifty pounds of fish a week around among his friends. He fishes, but not primarily for fish. He is like one of America's crack bird photographers who will take weeks away from his work and travel to the corners of the continent in search of bird pictures. Tirelessly over the years he has lengthened the list of species that have posed before his lenses. Often his splendid photographs grace the magazines; but for himself he has kept few, even of the best. He turns them all over, without compensation, to an organization interested in conservation. He takes pictures, but in the process finds a deeper satisfaction than that furnished by the photographs themselves.

Nature photography for what, if not for money or for pictures?

We Americans urgently need a new philosophy of leisure. The choice before us is suggested by the two ways in which we pronounce the word which we spell recreation. Is it "wreck-creation" or "re-creation"? As we use our leisure, as we choose our avocations, we may destroy creation's investment in us and our surroundings, or multiply it many times upon ever higher levels.

Hobbies are many. What they take from American

Tree swallows. Instinct, that foregleam of intelligence and personality, guides this swallow, makes it adaptable to a nesting box, and gives to each its individuality.

pockets and hours amounts to a major expenditure of time and money; of life. The more reason then that we invest our leisure to the blessing of America through the re-creation of ourselves. Often a hobby is chosen to balance our work. If we work with things, it refreshes us to play with people, and vice versa. The camera may be a sympathetic companion in whichever of these play fields our need lies. Because my work is with people whose problems press constantly upon me, Nature photography is an escape from people, the better to help people. Hence when I reach for my camera kit and start for the open spaces, I do it not with an eye on the picture market, or the salon jury, but strictly for my own sake as a human being who needs the elemental back-talk and uplift of earth, sky, and sea.

The eye and mind are a marvelous team for reporting the drama that lies back of Nature. Without the eye, no data; without the mind, no truth. But eye and mind must be a team. Hence when the camera, which is primarily an extension of our power of sight, is taken afield to look at Nature, it must be escorted by a mind that is striving humbly to be in tune. If not, the "little we see in Nature that is ours" will not increase by much even though we point a thousand dollars' worth of camera at it.

By being in tune with Nature, I do not mean any romantic sentimentality about Nature. The Nature photographer must be as objective as the scientist. He is not privileged to see what is not there. But, like the scientist also, he must be alert to all the relationships and implications of the natural objects that he photographs. For nothing is isolated in Nature, or static; all is relationship, function, process, part of a whole. If the photographer is to see this he must also take with him imagination, wonder, awe, and even joy. Only so guided can the lens, looking at data, translate them into truth, for the mind is more than half emotion, and we do not truly see what we do not feel. The more truth the Nature photographer thus sees with his awakened mind, the more often will his pictures rise from mere records into works of understanding art.

But let us now go afield! What specifically has Nature for her cameraman? For me, Nature has seven great words or deliverances, each of which is a whole world of opportunity for the camera. They are Energy, Life, Order, Beauty, Purpose, Personality, and Community, separate and intermingled.

The entire realm of sky and earth is alive with Energy silently pouring in from space as the sun's radiation, or working as quietly in magnetism, crystallization, chemical attraction, growth, or life force. The behavior of water is a convenient and conspicuous, though necessarily limited, symbol of this all-pervading power.

Here we are, then, by a brook coursing through till, or glacial detritus, left by the continental ice sheet in southern New England. At our feet it has encountered a ledge of mica schist, the roots of ancient mountains. Probing for a weak spot it found a dike of pegmatite or coarse granite, and then with all the patient tools of erosion — water, silt, gravity, frost, chemical action, time — it chiseled through to form a miniature fall, pool, and gorge. Today, in early April, a cloud fleet sails through the blue backdrop of sky toward some distant treasury of rain, while the stream, full and icy cold from melting snows, sings down its aisle of pebbles bordered by fresh grass, forsythia, and maples. But let the season, the hour of day, or the mood of the weather king change, and all may be spangled by dew, shrouded in mist, rain, or snow; beaten by hail; festooned by frost; locked in ice; or framed by lightning, rainbow, dawn, or sunset.

"Brooks and waterfalls," writes a salon judge," are too trite for exhibition subjects." Never mind. I come

here again and again with camera for *my* sake, not his. For me this tiny cataract and canyon declaim the whole vagabonding tale of water, which, responding to the energies of sun and earth, ever changes its form and function, now refreshing, now building, now destroying, but always decorating earth and sky with memorable loveliness. At this trite fall, or before any of the myriad forms of water, each a model of the cosmos, guided by a mind in tune, the camera may capture energy still at the endless task of creation.

If any Nature photographer accompanies the first rocket navigators to the moon, he will miss, primarily, Life. Photographically speaking, what a vacuum would be created by removing from our experience the world of biology! So extensive a field might easily yield a million symbols; but I shall choose the tree, the apex of the green world of flowering plants, and the marvelous provider of many things for beast and man.

A thousand details of a tree make it a dramatic symbol of life force, each a challenge to the ingenuity of Nature's camerman with mind in tune. The very stance of trees on our New England hills — crowding about brook and lake, parading across the ridges, climbing hand over hand up the crags, or accepting the lonely watch of distant summits — shouts to heart and mind of life, conquering.

But of all tree phenomena, the most dramatic is the bursting bud, whether of leaf or blossom. Yesterday, as I stood by the brook, the ice still lingered in little bays, and the trees were dead things towering over the scar debris of winter on the forest floor; but today the red maple buds have burst, male and female, and a scarlet haze fills the upper branches. These tiny red flowers carry me back to the circumpolar hardwood forests where first they bloomed and then left their fossil record as the glacial ice pushed their forebears south; but now their re-invasion has already carried them to the edge of our northern tundra. The pictorialist and the salon judge may laugh as I note in outline a whole series of red maple studies: A colony of trees blooming by the brook; details of bark, bud and wood; flower clusters, pistillate and staminate, close-ups with extension tubes under the lights at home; the fertilized ovules that swiftly become the keyed fruits, so brilliant by transmitted light; the leaves that unfold as the fruit ripens. And so through summer until, the year's growth complete, the green chlorophyll mysteriously withdraws and the uncovered leaf minerals paint the hillsides in flame, and, at last, winter bares the daring architecture of limbs and trunk. Let them laugh! I have caught, to *my* satisfaction, life fulfilling its creative function.

By Order in Nature I mean those qualities that suggest organization, arrangement, regularity, and dependability. It is that which makes adjustment to Nature and the foretelling of her events possible, and without which all would be capricious, chaotic. Order, too, presents a million symbols — the mineral following its crystal habit, eon after eon; the plant always presenting "first the bud, then the ear, then the full grain in the ear;" the animal ever reproducing after its kind; or the dependable routine of the seasons of our temperate zones. Arbitrarily I shall choose the four seasons as our symbol.

What a wealth of material here for the lensman of the outdoors! Abstractly, our seasons result from temperature changes due to changing incident angles and hours of sunlight. But what make them fascinating to the Nature photographer are the myriad responses made by life to these cycles of heat and light. Follow any detail through the year and you tell the story of dependable order. Is it water? Capture snowflakes on cold slate and put them under the microscope; or turn your telephoto to the high-altitude snowfield of summer,

The cecropia moth meets the spring. The moth, emerging from its pupal sleep, signals the Order that marks the changing seasons.

Waterlily and frog. Gratifying the eye and delighting the intellect by its fitness, the waterlily is a cherished memory of the Beautiful.

or lesser focal lengths to lowland watercourses. Is it the world of plants? Here then are the ancient horsetails, club mosses, and ferns, those denizens of the torrid jungles of 200 million years ago that have survived by reducing their sizes from giant trees to herblike growths. Or, follow any wild flower as each species awakens, grows, and blooms as its required hours of daylight build up with the advancing year, each hurrying to produce its covered seed, its miniature self, its assurance of survival, before the cold returns. Or the insects, moth or butterfly emerging from its pupal sleep, mating, laying eggs, later to hatch as larvae which eat and eat and eat that they, in turn, may pupate before the temperatures again become fatal. Or, the birds, migrating northward as warmth and food supplies beckon; nesting, rearing their young, flocking and returning southward as the cycle closes. Or, the realms of amphibian, reptile, and mammal life, each accommodating itself, its home, and ways to the facts of changing heat, cold, and light, and their attendant abundance or scarcity of food supply.

Let the mind be in tune and the heart sympathetic as the camera is swung into action upon beach or meadow, upland or mountain, always sensitive to the seasonal problem facing the object or creature before the lens, and the picture, whether it please a jury or not, will nonetheless capture order regnant in the world of Nature.

Mr. Webster defines Beauty as that quality or combination of qualities which gratifies the eye or ear, or which delights the intellect or moral sense by its grace or fitness to the end in view. I need hardly labor the point that many natural objects fit this definition of the beautiful. Tastes differ with individuals, cultures, and centuries, but all would agree that the harmonious, balanced, and rhythmic patterns, sounds, and colors of Nature have inspired our primary ideas of the lovely. Without such inspiration the pictorial and graphic arts, especially, would be largely lacking in content. Hence, the pictorialist and the Nature photographer may have many happy outings together when the quest turns upon the beautiful in the outdoors.

A glance through the catalogs of our salons, whether in monochrome or color, discloses the popularity of natural themes. Purely pictorial salons have accepted from me transparencies of such varied subjects as lightning, minerals, mushrooms, wild flowers, seed pods, tree buds and blossoms, moths and butterflies, amphibians, reptiles, birds, and mammals — a fair cross-section of our natural history. Yet all were accepted by juries selecting not Nature exhibits, but purely pictorial shows. The experience of many other amateurs bears out this judgment that Nature subjects, carefully composed and lighted, often rise above mere records into pictorial quality because of their sheer loveliness.

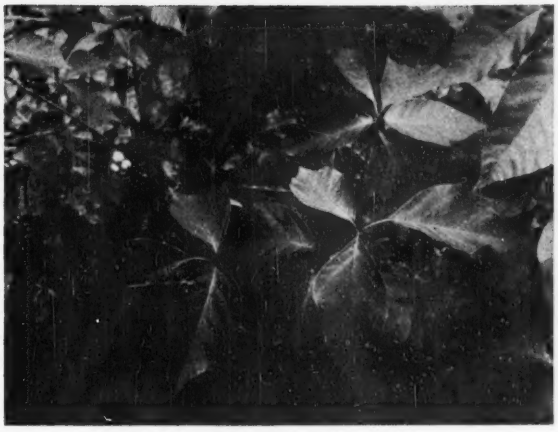
A convenient symbol of natural beauty is the water lily. Juries grow tired of them, I know; but for gratifying the eye and delighting the intellect by their fitness to their environment, they are supreme. Hence, for my own sake, I delight to find a single bloom or bed of them, their classically balanced parts spread to the sun while they wait for their favorite cross-pollinating insects, with perhaps a frog crouched nearby greedily hoping for the same winged visitor. Strong side-lighting to improve modeling, or back-lighting to dramatize their fragility or the droplets of a passing shower upon their petals, the presence of the aforementioned frog, or insect, and always the careful inclusion of the curves of leaves, stems, and buds in the composition, with a glance into the mysterious underwater world, will often remove the triteness of an over-favored subject and add to summer's shooting a cherished memory of the beautiful.

In Nature, purpose is that characteristic which so often suggests the presence of a plan, intention, or design in some structure or functioning of a plant or animal. The floating leaves and buds of the pond lily; the silken parachute of the milkweed seed; the protective green of the katydid; the wings, talons, and beak of the osprey; the adaptation of the beaver to its habitat of woodland and stream — all of these and many more observations of natural things seem to indicate first, a problem to be (Continued on page 162)

Scientific research into the poisonous properties of poison ivy points to hope of a chemical that will provide a —

Poison Ivy Counter Attack!

By E. JOHN LONG



WHEN mah-jongg sets became the rage a few years ago, a number of city apartment dwellers suddenly developed a mysterious skin affliction. Puzzled doctors swore it looked like ivy poisoning. But the victims, in most cases, had been no "closer to Nature" than a potted geranium plant. All of them, however, played mah-jongg. The malady was finally traced to contact with cheap mah-jongg sets, made with improperly cured lacquer to meet a quick popular demand.

And, as an odd cross-trail, doctors found that mah-jongg players who munched cashew nuts were more likely to have skin trouble than others! Cashews, before roasting, or if imperfectly roasted, contain a milky sap that also irritates the skin.

Japanese lac trees, cashew nuts and poison ivy seem worlds apart, and, geographically, so they are. Botanically, however, they all belong to the same family (*Anacardiaceae*), and all of them produce a sap that causes skin eruptions.

The relationship, and the fact that counter measures had been found for lac and cashews, suggested an idea to Dr. Irwin W. Sizer, associate professor of physiology, Massachusetts Institute of Technology. Although there are many treatments and cures for ivy poisoning, some effective and some questionable, perhaps a *preventive* might be derived from poison ivy itself to make it harmless, as lacquer and cashew nuts are made harmless.

Recent word from Cambridge indicates that Dr. Sizer and his associates, after five years of experimentation, have come up with an antidote that marks the successful conclusion of one of the most unusual research projects in recent years.

Much of the success of the undertaking was due to an attitude adopted by Dr. Sizer from the outset. Botanists will recall the experiments of Dr. Frederick V. Coville, who tamed the wild blueberry by "treating it rough." Well, the M.I.T. group proceeded along somewhat similar lines with poison ivy. They early decided that the members of its family were largely a bad lot, so evil by disposition and nature that they would probably *poison themselves* if they did not manufacture, within themselves, some enzyme or catalyst to offset a tendency of the plant to commit hara-kiri.

Suspicions of such internecine skulduggery were aroused by the findings of a Japanese scientist, Yoshida. As long ago as 1883 he isolated a fluffy, white powder from the poisonous yellow sap of the lac tree. Yoshida called it *laccase*, and considered it responsible for converting the sap of the lac into the beautiful, solid-black lacquer of commerce. Yoshida was not sure, but he presumed that *laccase* oxidized, or made harmless, certain ingredients of the sap, especially *urushiol*, which is also the principle trouble-maker in poison ivy.

Following the same reasoning, the Sizer group sought a substance that might be derived from the poison ivy plant itself, a counter irritant, so to speak, rather than an alien enemy.

In order that no aspects of the problem would be overlooked, the long series of experiments retraced much familiar ground, and reexamined many accepted notions about the cause and cure of ivy poisoning, relegating most of them to the witch doctor and the patent-medicine barker, whence they sprang.

Human guinea pigs, some of them self-styled as "immune from ivy poisoning," submitted to both the toxic effects and the various treatments, sometimes two or three remedies at a time. There was really much suffering for science's sake, because no bane, perhaps, has brought forth so many quack remedies as has poison ivy. But a thorough job was done. As a result, a number of theories about poison ivy can be confirmed, and a lot of old wives' tales can be quietly dropped down the drain, where they belong.

"Contrary to common belief," Dr. Sizer declares, "the irritant principle is not carried in the air, except in the soot from a fire. Contact, either direct or indirect, is required to obtain a skin inflammation."

So a note of caution — you *can* contract ivy poison-

ing in the fall and winter, as well as in the spring and summer, if you expose your skin to the smoke from a trash pile that includes poison ivy leaves, berries or vines.

The researchers found no one absolutely immune to the irritant, immunity being relative rather than absolute. The skin of some persons was so sensitive that the slightest brushing of the leaf, or the soot from burning poison ivy, caused a reddening of the skin accompanied by the most intense itching.

In some cases this early irritation was followed by the formation of blisters, which filled with fluid, finally breaking to release serum, as does a second degree burn. Ivy poisoning can become a serious affliction when this stage is followed by swelling of underlying tissue, and, after penetrating the skin, the irritant enters the blood system (lymph vessels), spreading to other parts of the body.

In checking various medicants, the M.I.T. group found that good old laundry soap and hot water, or a fat solvent, such as 100 percent alcohol, ether, or acetone, were still the best common remedies. This treatment works fairly well if applied within a few hours after exposure, or even after itching and burning begin. But warning — do *not* apply ointments containing oils and greases, which merely help to spread the poison ivy irritants over the skin.

Ivy poisoning, at this stage, may feel like a burn, but it does *not* take a burn's treatment.

Ever since poison ivy irritants have been known as compounds easily destroyed by oxidation, weak solutions of two chemicals, ferric chloride or potassium permanganate, have been effectively used on ivy-inflamed skin.

It was found, however, that very little can be done to "cure" ivy poisoning after the irritation has reached its height. Remedies should then center around attempts to relieve, not cure, the itching with the antihistamine drugs, such as benadryl or pyribenzamine, or by local applications of baking soda, Epsom salts, or "whitewash" (zinc oxide and carbolic acid in limewater). If, nevertheless, infection really sets in, you are a candidate for bed and penicillin, as you would be for any infected wound.

Can one get immunity by taking "shots?" Dr. Sizer is inclined to think not. Experiments over a period of ten months produced no marked immunity in most individuals, and occasionally made those taking the injections even a little more sensitive to ivy poisoning. When given injections repeatedly, a few persons were partially desensitized to normal contact with the plant, but the procedure was not considered a success.

For several years it has been known that poison ivy and related skin irritants (poison oak and poison sumac) could be oxidized, or made chemically inactive, by a substance called *tyrosinase*, a copper protein produced by mushrooms. Because it was not completely satisfactory under all conditions, Dr. Sizer's group continued the search for a derivative within the plant itself.

When it was found that a *laccase*, similar to that derived from the lac tree, and having the same effect on the allergens of the poison ivy plant as *tyrosinase*, could be isolated, the M.I.T. scientists knew they were on the right track! An antidote to the plant's irritants had been found which was effective, at least, in the test tube.

Now please do not rush down to the corner drug store and demand a bottle, or tube, or can of poison ivy *laccase*. Medical and drug specialists are still trying to work out a practical medium, or application, for the scientific discoveries of Dr. Sizer and his associates.

This will come in due course, but meanwhile, if you want a "preventive" that has been very effective for a long time, remember this jingle:

"Leaves three, let it be;
Leaves five, let it thrive."

The second line may avoid confusion with the innocent, five-leaved, Virginia creeper, a decorative and most desirable vine. Poison ivy thrives in every State, except California and Nevada, and in Canada. Poison oak grows most abundantly west of the Mississippi. Poison sumac claims few victims because it grows deep within northern swamps.

Reports indicate that poison ivy is on the increase in certain States, notably Maryland. So, if you feel in a vindictive mood, even after reading the possible dire consequences above, remember that the whole root of the poison ivy vine must be dug up, or the soil around the root must be treated with chemicals, such as amate, 2-4-D, or strong brine, or crankcase oil and kerosene.

Nothing will grow for some time, on the spot thus maltreated, but neither will ivy! Wear gloves, do not scratch your nose or brush back your hair, and decontaminate all tools. Stand to the windward of brush fires. Even so, back to laundry soap and water — or suffer! At least for the present.

Computation

By ALLAN E. WOODALL

This is incredible every year:
The peach-bloom sunsets against the blue
Of the starpool sky as spring comes near
And the warblers songs are bubbling through
And the larks sound sweet from the meadow grass
And the snowy stars are on the plum
And the sunset flush on the apricot . . .
Till all flowers load the fragrant sum
Of every little magic thing
That we lump together and call Spring.

On The Level

By E. LAURENCE PALMER

Illustrated by Clayton Seagears

This is the sixtieth in NATURE MAGAZINE'S *series of educational inserts.*

We have written most of these inserts with the fundamental problems of conservation forever before us. We have written about birds, mammals, insects, fishes, woody plants and herbaceous plants, about rocks and minerals, and about many other subjects. To date, however, we have not looked at topography as being of special significance to us. Of course we cannot, in this short article, adequately consider the total importance of topography, as it applies to many phases of climate, transportation and international relationships. So we must be content, here, to consider only one feature of topography. That aspect is associated with the significance of water level. And we must limit even this and deal with the levels of surface water, without exploring the subject of the importance of the level of the underground water table.

This arbitrary limitation of our subject, however, does not deprive it of richness of suggestion. Indeed, it permits us to look at the single problem from a number of angles, which would not be possible were we to try to take in more territory. So we will consider four main directions in which water levels are significant, choosing these because we feel that, as citizens, we should at least look objectively upon problems in the solution of which we must assume some responsibility. We have no axes to grind in this discussion. All we ask is that the citizen consider, from more than one angle, proposals made for adoption as laws of the land, and that you do not get the idea that water levels are significant in relation to only a few of our everyday problems, or that one viewpoint is necessarily the only one that must be considered. Above all else, we ask recognition of the fact that it is not likely that a water level established for one particular purpose can be assumed to be equally satisfactory in meeting all other purposes. In short, we want one to be able to decide whether a dam erected to control a water level can serve, at one and the same time, the demands of flood control, power production, irrigation, health, navigation, drinking water supply, recreation and wildlife. We ask consideration of proposed management of local streams from the pollution angle, the esthetic viewpoint, and a few other points of view, in addition to those just suggested.

In planning this insert, the writer sketched out four diagrams that he felt presented conditions that must be recognized in considering water levels. Into these diagrams, his friend, Clayton Seagears, head of conservation education of the New York State Conservation Department, breathed the breath of life. It is happy that the result, as was to be expected from the Seagears' touch, is humorous at the same time that it is serious. For this, the writer is, and he is sure the readers will be, duly appreciative.

As this is being written, flood waters are washing out cities on the eastern and on the western coasts of our country. In some parts of the world, drought threatens disaster to great numbers of persons, while in other parts the hopes of millions are drowned because of water in excessive amounts. It is doubtful if the delay of a few months in the publication of these words will in any way modify the truthfulness of this statement, although it may well be that the locale of the specific incidents will shift.

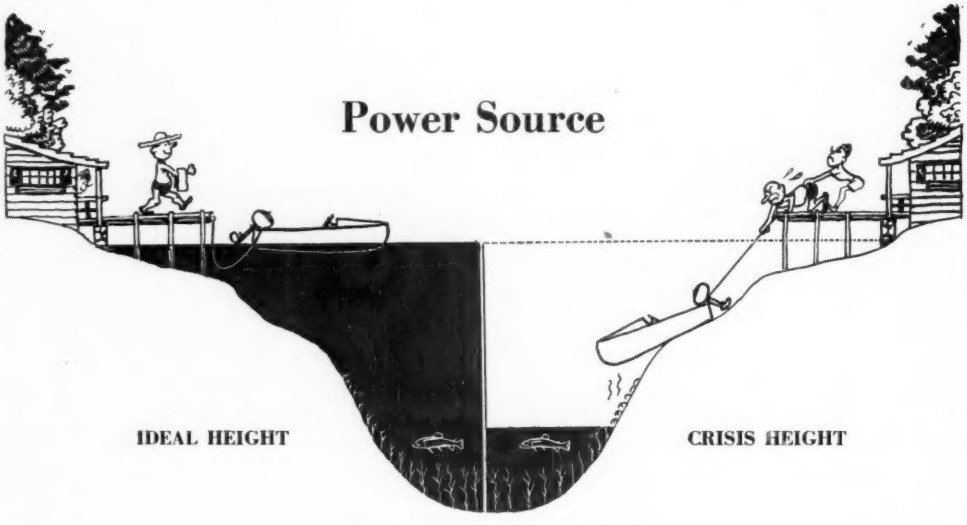
In a sense we are, as one poet suggests, essentially bags of living sea water moving about over the surface of the earth. I hope that we are more than that. But water is obviously essential to all living things. It constitutes from sixty to seventy percent of our bodies. It is a part of living protoplasm. I once wrote in a book that a man required twenty-five quarts of water a day to live a modern existence. Some of my critics took me to task saying that the amount was too high. It was a figure used by the military for determining the maximum number of men that could be sustained in an area. Obviously, the amount is greater when we consider that water is essential for drinking, for bathing, for sanitary purposes, for removal of sewage. It is used to carry cargoes that are basic in commerce, to generate power that gives us light and does work. While our bodies need only six pints per day to keep them going, we have been given the figure of 700 gallons a day per person as the amount of water needed in our modern civilization, exclusive of water used in generating power, in recreation, or in navigation. Of this 700 gallons used, it is estimated that all but 140 gallons are surface waters. If we do not generate needed power and light with falling water, we must generate it by using coal or oil. Coal and oil are nonrenewable resources. As long as the sun shines on water, there will be water vapor taken into the air and eventually this will fall to the earth, where it may be used for any of the many purposes we have found for it.

We have not always recognized that there are limits to the number of persons whose needs may be satisfied by the amount of water available in an area. As people

prosper, they produce more people, but the amount of water available does not necessarily increase at the same time. We are finding, in our larger cities on the east coast and on the west, that there are seasons of the year when it is important that water be used sparingly. We may even find eventually that to keep within the limitations set by water, we may have to limit the number of people living in an area, or limit the uses they may make of water. We may find, for example, that, in spite of the dictates of certain religious traditions, it may even be necessary that water be allowed to flow from taps only when it is being used more realistically than to satisfy a religious code. Putting all taps on meters may be necessary, and may have a salutary effect on many whose religious convictions may be sensitive to economic influence.

Our modern civilization is composed of engineers who profit by making dams, farmers who need a regulated flow of water to and from their lands, mechanics and merchants and other citizens who seek cheap power to deliver goods, to light homes, to power television sets. We have sportsmen who want such conditions as will guarantee a sustained yield of wildlife, and Nature enthusiasts of the present and of the past who feel that a place like Dinosaur National Park has a very real value in our scheme of things. The interests of each of these are threatened, or enhanced, by the level of the surface water in their vicinity. No one level can possibly satisfy the wishes of all. Because of this, it is important that we who vote have a reasonably accurate and clear picture of the situation, and will support or oppose legislation accordingly.

The question is, can we build a dam that will, at one and the same time, satisfy the needs of those who would produce power, control flood, irrigate lands, and provide wildlife and recreational opportunities, as well as provide the water needed for domestic household purposes. If not, then we must frankly admit that we as a group support the building of a given dam for a specific purpose, and are willing to sacrifice certain other things when we do this. In spite of what the politicians tell us, we cannot build a power dam that will be of maximum use for flood control, for irrigation and also provide superior facilities for recreation and for wildlife. Let us just be frank in what we are doing here. If politicians ask us to vote public funds to build a dam for flood control, then let us be sure that that is what it is built for and what it is used for. If they want one for power, then let us build it for power, and if they want it for wildlife and recreation, then let us build it to suit these needs. But do not let them sell us one with the argument that it will satisfy all needs. It just will not.



On the Level, Above and About A Power Dam

WHETHER we like it or not, the possibility of producing saleable hydroelectric power is behind most of the major dam projects. Some dams can well be built for this purpose, in spite of the way they may upset returns from migrating fish, involve flooding of valuable lowlands and of cities, and even in spite of the danger they may cause as a potential flood menace to places downstream. Ideally, the reservoir above a power dam should always be full. The deeper that reservoir the more power it can produce. Since a column of water one inch square and one foot high weighs approximately .43 pounds, that amount of pressure per square inch will be added

for every foot of height to the dam. When we look at the height of the major dams of the world, we may read in those figures some significance in interpreting our own prosperity.

Name of Dam	*Country*	*Height*
Hoover	United States	726
Shasta	United States	602
Grand Coulee	United States	550
Ross	United States	545
Hungry Horse	United States	530
Fontana	United States	480
Anderson Ranch	United States	456
Chambon	France	450
Pine Flat	United States	440
Detroit	United States	440
Sautet	France	414
Grimsel	Switzerland	377
Camarasa	Spain	333
Burrinjuck	Australia	247
Mettur	India	230
Dneiper	Russia	200

The volumes of the American dams listed above are ranked in the same order as to height, ranging down from Hoover Dam, with 128,000,000 cubic yards to the Detroit Dam, with 14,700,000 cubic yards. Russia's Dneiper Dam, when it was in perfect condition before the war, totalled 291,000 cubic yards. Obviously, if these figures mean anything, and size of dams is important, we in America have a considerable power differential.

The reservoirs behind a power dam may be more important than the size of the dams themselves where a sustained yield of power is required. The world's ten greatest power reservoirs are all in the United States, the greatest of these being Lake Mead with a capacity of 31,142,000 acre feet covering an area of 246 square miles. Garrison Reservoir covers 610 square miles, but has a capacity of only 23,000,000 acre feet. Our Florida Lake Okeechobee covers 724 miles, but has a capacity of only 2,700,000 acre feet. It is not a power dam reservoir, however, and was built for navigation and flood control purposes. In the State of New York, a few years ago, there were 402 water-power stations that produced more energy than was produced by water power in all of South America, Africa, Australia and the islands of the sea combined. If Governor Dewey can have his way, and the St. Lawrence can be harnessed, the productive capacity of the power in the State will be increased tremendously. At one time, New York State had harnessed one-third as much water power as was produced in all of Asia.

Considering the water-power story, one is compelled to hope that, were the water power of the world adequately harnessed, we might have conditions that would make it possible for many now living in poverty to find sufficient comfort and happiness so that their economic circumstances would no longer serve as a threat to world peace. While we in America can now, during 75 percent of the time, produce about 50 million horsepower of energy through use of surface waters, it is believed that we could eventually produce approximately 80 million horsepower. This power is ordinarily efficiently available within a radius of at least 300 miles of the source of production. Probably few other countries have developed such a great proportion of their potential water-power resources.

One should not assume that because water power is available it is necessarily the best source of power for an area. In many areas where the rainfall is variable, adequate water power may not be available at certain times of the year. Where supplementary sources, such as coal and oil, are easily available, the renewable resource of water power may be used to prolong the availability of the non-renewable resource.

Dams erected for power purposes may vary in the length of time they are useful. Where the river above the dam is heavily laden with sediments, the reservoir may fill up with silts before the dam has earned enough to return the costs of its construction. Some of us feel that government projects must in the long run be self-liquidating if we do not wish our whole economy to be liquidated. Of course, the sediments deposited above the dam must be taken into consideration, since they reduce the volume of water held back by the dam. Various estimates as to how long it will take for Lake Mead above the Hoover Dam to become a mud flat vary from a pessimistic 50 years to an optimistic 150 years. To be economically sound, the project must pay for itself before it becomes useless. It would seem to a layman as though this makes sense.

Where the silts are taken from a sediment-laden stream by a power dam, this will naturally affect the amounts of sediments that would normally have been deposited below the dam. In the Colorado River, for example, between 1925 and 1941, some 200 million tons of sediments of the river were normally deposited near where the river entered the sea. This was at about the rate they were washed out to sea by the tide. Taking the sediments out of the lower stretches of the river has meant that the tides remove more than is being deposited. As a result, the region affected by the tides is moving gradually upstream. It has been suggested that there is real danger that this may continue to such a point that it may affect great areas in southern California that have been protected by these sediments. It must be recognized, then, that a dam upsets conditions both above and below the dam. We just must be careful to be sure that these upsets are to our advantage.

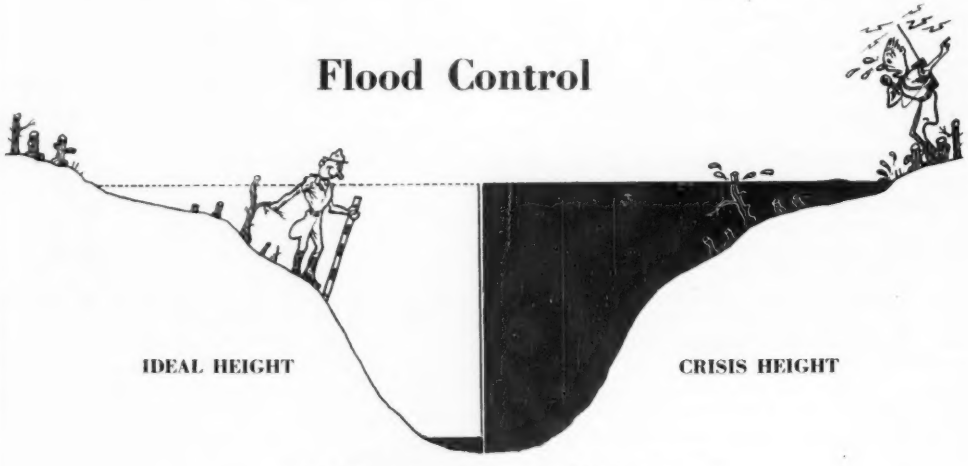
As is shown by the diacartoon, the ideal water level above a power dam is at the top of the overflow of the dam. If this level could be maintained, the power could be used to the maximum. During periods of drought, however, the reservoir will not remain full and the level must drop if power is produced continually. In a crisis, then, the reservoir above a power dam will be at its lowest level. As far as we are concerned, this is the one idea we want you to keep in mind about power dams,

and water levels above them, as you read the rest of this story.

We can recognize that the construction of dams may provide labor in times of depression, but they also cause debts that must be paid. They provide water that irrigates farm lands, but these new lands will be competitive with already established sources of crop production. They may regulate the flow of streams, but they may prevent the migration of fish, such as salmon, and thereby cause a loss that must be reckoned against any profit arising from other aspects. They may prevent floods, but that is hardly a good argument to advance in Johnstown, Pennsylvania, or Ventura, California, both of which were flooded when dams were washed out. They may remove sediments from one part of a stream, but will build them up in other parts. They may help navigation, but in so doing they may interfere with other functions of normal waterways. They may increase the amount of water locally available for human consumption and domestic purposes, but they may, by so doing, distort the conception of the community as to how many persons can be supported in that community in an emergency. In short, dams are not undisguised blessings, and we as a people must be sure that they, and they alone, can yield the results we hope to get from local, flowing, surface water.

It is surprising that, with water power such an important factor in man's scheme of things, that a new book, *Water and Man*, practically ignores it. This only emphasizes the other roles that water may and does play in our happiness and success.

The problem of power is important in matters of world peace. We in America have been and are being prodigal in our use of coal and oil as a source of power. We waste these resources in production, in transmission, in processing and in use. If we are to survive, we must supplement these sources of power with an intelligent use of water power. Somehow, we must find a way to reconcile the demands for efficient mass production on a big scale with the protection of the interests of small individuals working under the banner of individual initiative. Most of us have faith that this can be effected, but it will call for a higher degree of statesmanship and public integrity than has been shown at all times in the last half-century. The alternative is chaos, and the sooner we recognize this, the better.



On the Level, Above and About A Flood Control Dam

Floods are spectacular. They kill people in great numbers and crash the newsreels, newspapers and radio programs without the need of any subsidy whatever. They are so sufficiently widespread and frequent that they are brought home to all of us often enough and effectively enough so that we recognize a degree of public responsibility in their control. It is only natural, then, that any group seeking public support for the erection of a dam will not overlook the possibilities of that dam in preventing floods. There is a danger, however, that a group sponsoring a dam being erected for one purpose may, with no justice whatever, advance flood control as a supporting argument for it. It is this aspect of the situation that we now wish to consider.

Let us look at our diacartoon above. In this, we see that, ideally, the water level above a flood control dam should be as low as possible. In fact, ideally, there should be no water whatever in the reservoir above a flood control dam except in time of flood. This would mean that, in case of an upstream excessive downpour of rain, there would be ample room to take the surplus water and prevent it from going downstream in great

volume where it might cause damage. In a crisis, then, the reservoir above a flood control dam would be full and the water level would be at the top of the dam. This, as you will observe, is the direct opposite of what holds in a dam constructed for the production of power. How can the two possibly be reconciled unless the capacity of the reservoir far exceeds that needed for the planned use of water power? If a dam is constructed as a dual purpose structure, then its use in holding back water for power production would have to be arbitrarily limited if it was expected that the dam would be prepared, in a crisis, to hold back flood waters that might be a menace to the public good.

In the broad sense, floods may be good. Over the centuries, they have built up the broad floodplains of the world that at present probably yield the major portion of our food crops. When we, by means of dikes or other means, force a river to carry its sediments out to sea we are losing wealth that should not be lost. The mouths of the Mississippi, Orinoco and Nile are rich, in part, because of the wealth dumped on nearby flats by floods of the past. Men have tried to keep some of these, particularly the Mississippi, within bounds, with the result that the river bed is now much higher than the neighboring lowlands. When a levee breaks, great damage may result. Probably the best argument offered for the construction of flood control dams is simply that they may prevent the stream, in its lower stretches, from rising to such heights that it may overflow its banks. At the best, however, the construction of levees and of flood control dams are merely measures of appeasement. Old Man River just keeps rolling along, and the higher the levees, the greater the damage that may result should they be breached. Levees and dams will never correct the trouble at its source, and, unfortunately, the correction of the trouble at its source does not call for extravagant expenditure of public funds that appeal to the engineers and to the pork barrel specialists. No stream can ever reach serious flood proportions if the water that falls in its upper stretches is held on the ground by a good cover of vegetation, and if the snows on the ground are also kept in the shade by trees and similar plants. Trouble brews when snows accumulate on bare soil and are forced to melt rapidly by the falling of warm rains or by exposure to warm sun. Rain or shine, you cannot prevent flood waters forming if the ground is bare and the snow is exposed to the sun. You can delay them, but you cannot stop them.

If, instead of wasting our wealth on the construction of big, expensive dams downstream in a drainage system, we encouraged the making and maintenance of billions of little, inexpensive dams upstream by beavers, by contour farming, by reforestation, by fire prevention, our flood menaces would be greatly diminished. If we do not see to it that these little dams are maintained, we will have to build bigger and more expensive dams downstream, and expect bigger and more expensive floods in the future. The one thing we cannot expect is that by building a power dam that is managed for the production of power we can obtain a maximum of control of flood waters thereby. Study the first two diagrams in this article and try to figure out how you can reconcile the two. It cannot be done.

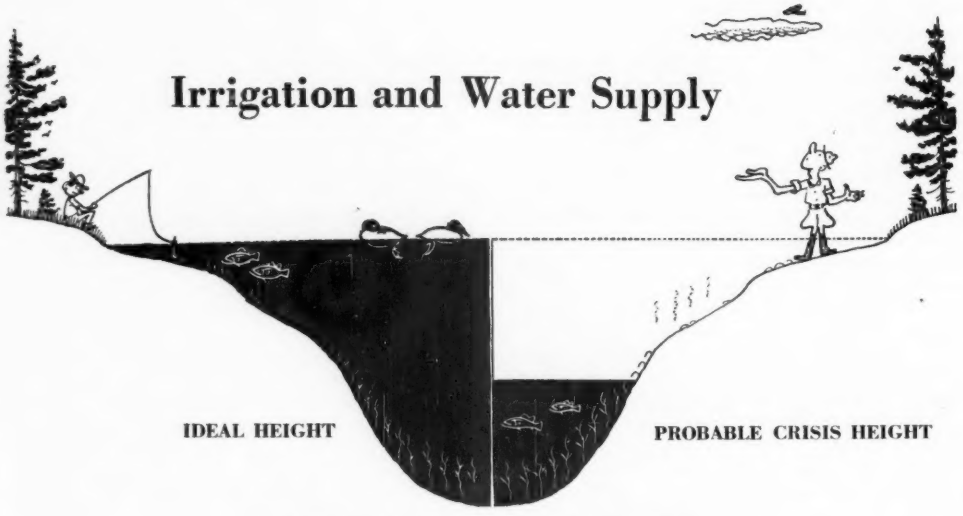
Do not conclude from what we have just said that we are discouraging the construction of all major flood control dams. We are merely saying that our first step is stopping flood waters at their source, and building big dams does not do that. Since there is little likelihood that we can educate the public generally to an appreciation of this fact, so that the headwaters are adequately anchored, it may be necessary to continue to construct inefficient and extravagant flood control dams downstream. Every flood menace will bring to Congress a recommendation that another dam be built immediately, and this will not be discouraged by politicians and others who may be in some position to profit by such construction.

Unfortunately for getting public support, there is little that is spectacular in the construction of a billion little dams to compare with the result that comes from the construction of a few big dams that cost the taxpayers possibly a billion dollars. We may be assured that floods will continue to be spectacular, widely spread geographically and of sufficient frequency to support appeals for the construction of huge flood control dams. Before we support these measures, let us lend our weight to attacking the problem at its roots. Surely, this calls for the best efforts on the part of the enlightened public, of which we hope you are a part. The situation is such that the proponents of the big dams have the easier row to hoe in presenting their case to the public. This does not in any way lessen the obligation of others to state their case objectively.

The 1950 *World Almanac* lists 85 major reservoirs of the United States. Of course, 55 are listed as being designed, in part at least, for flood control purposes, and only five of these are considered as being constructed for flood control only. Thirty-six are listed as being constructed for power production and for flood control, and only five are listed as being constructed solely for the production of power. These figures make one do a little wondering. Interestingly enough, not one of the 85 listed are located in New York, and yet at one time that State was producing seven percent of all the water power in all of North America, and six percent as much as was produced in all of Europe. Of course, Niagara Falls, with its natural reservoirs of the Great Lakes upstream, is an important factor in the story of power production by the use of surface water in New York State.

In too many cases proposals for construction and dams, whether justified by need or not, are hailed enthusiastically by local chambers of commerce. They see such activity bringing money and business into the locality, and an opportunity for the leaders of the civic group to take credit for bringing it. So a publicity campaign is put on, and pressure is brought to bear on representatives in Congress to put the construction program over. In these cases the only value seen is monetary, and that usually of temporary character.

Irrigation and Water Supply



On the Level Above and About Dams Constructed to Help Irrigation, Navigation, Water Supply, Debris Control and River Regulation

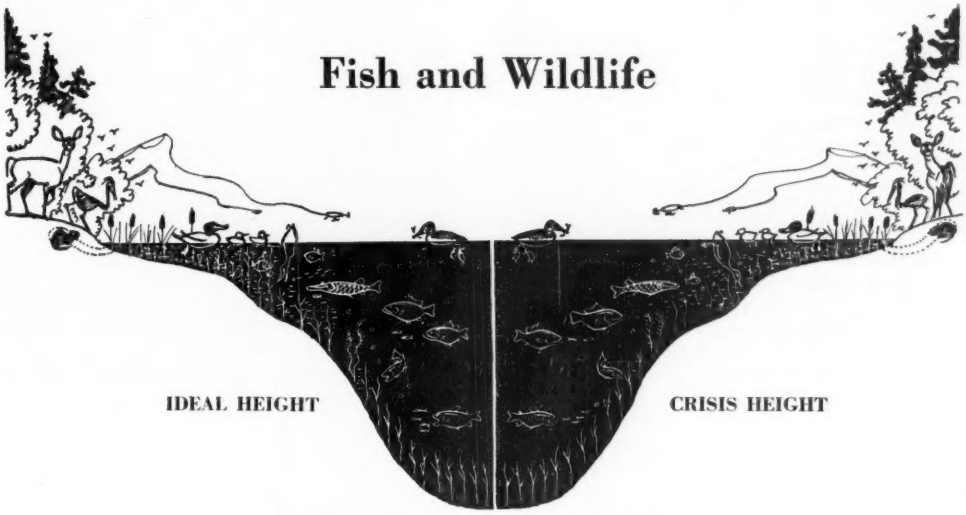
It is safe to assume that anyone sufficiently interested in dams and water levels to have read this far in this article has sufficient intelligence to be able to draw his own conclusions as to the importance of water levels above dams constructed to help irrigation, navigation, water supply, debris control and river regulation. These classifications are suggested in the listing of the functions of reservoirs in the *World Almanac*. We have called to your attention that, ideally, the water level above a power dam should be at the top of the dam, while it should be at the bottom of the dam that is constructed for flood control. Use your own good judgment in deciding where the levels should be in reservoirs designed to meet the suggested classifications. Thinking these through will probably lead to confusion on your part, but that confusion will hardly match the obvious confusion we have in our national policies for stream management. We are not here concerned with directing convictions as to the merit of any one project, but we do feel that it is hardly efficient for more than one government agency to seek the management of a given stream, each calling for the erection of a dam at approximately the same place and possibly for a different or contradictory purpose. We are not in favor of one government agency erecting a dam that will defeat the purpose of another government agency, as would be the case where National Park areas would be flooded by agencies not charged with responsibilities for those areas, and particularly where private interests would be advanced at the expense of public interest by the construction of such dams.

Obviously, the ideal water levels above dams constructed to assure water supply, irrigation, navigation and river regulation would more nearly approximate the levels that would be desirable for power production. The levels demanded by dams aimed at flood control would not be suitable for the purposes listed ordinarily. Of the 85 listed reservoirs previously mentioned, 30 are listed as being designed to assist in irrigation projects. Ten are listed as designed for assisting irrigation projects only. Three are listed as designed only to help irrigation and flood control, and four are listed as designed for power production and irrigation assistance. The remainder of the 30 are designed for various combinations of the functions suggested.

The water supply function of some dams is real in some of our major centers of population, as in New York's metropolitan area, and the area generously recognized as being within the city limits of Los Angeles. As the populations of these congested areas continue to grow, the water demands will be greatly increased. Only last summer, New York was so desperate that it employed untried methods for inducing rainfall over their watershed, as our artist has so aptly shown. Should we ever face a war situation in which the dams controlling the water supply of these major cities were destroyed, the confusion and distress that would arise as a result is not pleasant to anticipate. It is not too far in the realm of fancy to suggest that such a calamity is possible, and it might be healthful to plan a future in which our population were so evenly distributed that we did not expose ourselves to the possibility of such a serious situation.

The needs created by navigation and river regulation are not too unlike those of power production, except that they do not offer so conspicuously an opportunity for retiring any necessary investment through earnings. Ten of the listed 85 major reservoirs are reported as designed to help navigation, one of them being designed solely for that purpose. The country is covered, however, with small dams that make small reservoirs that help in this problem. The Erie and the Barge Canal systems in New York State are examples of major navigation projects maintained in part by waters held in reserve by dammed surface water. We cannot overlook the desirability of so managing the surface waters that flow off our country that we can make a maximum use of them in transporting goods. Costs of shipping by water are so much less than those for shipping by rail overland that the major portion of some of our commodities are moved by this method in suitable areas. In states such as New York, where there is a well-developed canal system, the traffic over the canals is one-sixth that of the Panama Canal and one-sixteenth that of the Mississippi River. It may be extended considerably in the future. There is little doubt but eventually it will be possible for ocean-going vessels to penetrate the heart of the continent through the Great Lakes system by way of the St. Lawrence River.

Fish and Wildlife



On the Level, Above and About Dams Influencing Recreation and Wildlife

When the politicians seek public support for a pet project involving the construction of a dam that will affect the water level, one of their choice arguments centers around the advantages that will accrue to fish and wildlife, and to the associated recreation facilities. If the reservoirs to be formed flood rich lowlands where wildlife abounds, they play up the fact that the impounded water will permit the passage of canoes and other recreation boats to points not formerly accessible. If the reservoirs flood established marshes were waterfowl nest, they suggest that there will be newer and more suitable nesting sites. They argue that more water means more fish, automatically, and more aquatic furbearers and more waterfowl. Let us look at the situation critically.

Suppose a reservoir were to be constructed that would serve as a check on floods. Obviously, the shore line would vary greatly as the flood waters came in. Ducks nesting on the margins of such reservoirs would find their nests flooded out, and one such flood might easily wipe out the year's local crop of ducks. How would such a system help those who wished to maintain a duck population. Around the borders of such a reservoir there might well be a forest growth. At some times this would come to the water's edge while at others it would be remote from the water. How would this help the situation for furbearers and for wildlife that might favor the permanently wood-margined waterway as a place to seek food and shelter?

Following the spring flood season, a flood control reservoir might well be full. When the water temperatures reached a point at which fish would mate and lay their eggs, these animals would reproduce, of course, usually in the shallower waters. After the eggs were laid, either in nests or among the weeds, the flood control reservoir might easily lower greatly the level of its surface. This would leave the eggs and young stranded high and dry. How could a maximum or even a good fish population be maintained in such a waterway? The low-

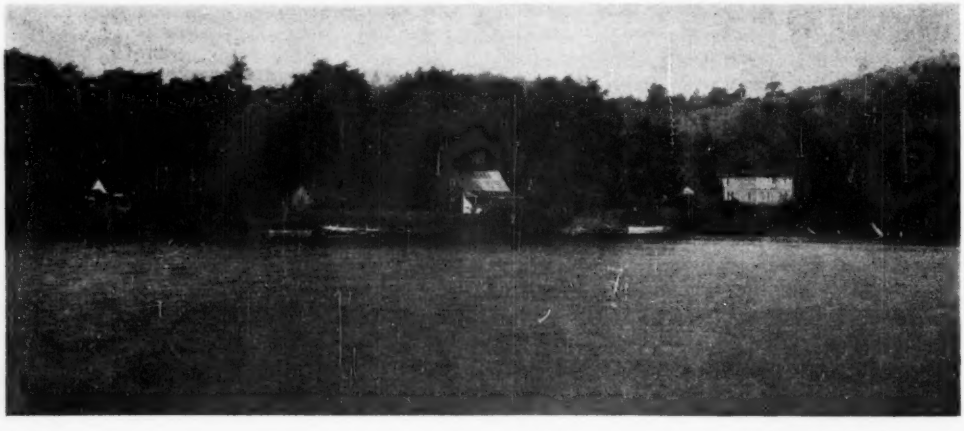
ering of the level of such a waterway would, of course, expose the water plants and marsh plants that would border a permanent pond, and these, of course, would die during the critical period. They would not then be available as food and shelter to the ducks, fish and wildlife that used them to maintain an existence. All you need to convince yourself of the validity of this argument is to examine with some intelligence the shore line of some permanent pond and compare what you see there with what you see in a reservoir where the water level fluctuates greatly through the year. Some aquatic food plants are highly susceptible to drought, and vanish from an area once they get the exposure they would get in a reservoir that did not maintain a permanent water level.

When the water level goes down in a pond that has supported forms of wildlife, the nesting sites no longer become suitable and the food plants diminish. The same thing happens to the fish that require a stable depth, at least during the time the eggs and young are in critical stages. You can have no large ducks or large fish unless you can protect little ducks and little fish. You cannot do this in a reservoir such as is necessary to supply the needs of power production, flood control, irrigation or the other functions recognized in building a dam to correct the more important threats associated with a stream.

It has been suggested that the construction of dams and their associated reservoirs improves camp sites and makes recreation more enjoyable in the area. Maybe this is so, but you have all seen, felt and possibly smelled what happens when a shore line retreats rapidly in the summer. Practically impassible mud flats may separate the firm shore from the navigable water. Windrows of dead fish may strew the shore and make cottage life comparable in many ways with living near a city stockyard, though the scent is a bit different. We go to camp in summer to swim, but what good does it do one to wade through stretches of mud to reach water in which you can swim and bathe only to have to wade a similar distance through mud to get back to shore where there may be no water with which to wash the mud off. To be sure, we can construct docks with which we can hurdle the mud flats, but these do not prevent the stench or the unsightly mess that follows a rapidly retreating shore line.

Fish and wildlife do not thrive in a situation where there is a rapidly fluctuating shore line. This, of course, may not be true of tidal flats, but these flats are periodically dry and wet with the periods short enough to permit survival of many forms. You cannot construct dams for power and flood control without creating reservoirs with a fluctuating shore line. How, then, can we defend the erection of dams on the grounds that they individually will always serve these diversified needs? We cannot and we might as well admit it. This does not mean that damming may not be valuable in improving conditions for wildlife. You may have seen what it has done in the Bear River Bay marshes of Utah, and may have heard of the dams that have been constructed in many areas where the breeding of ducks has been encouraged. These dams are quite different from those erected to meet commercial demands of power, navigation and flood control. It may be significant that, in the listed purposes for which the major reservoirs of the country were constructed, no mention is made of their effect on fish and wildlife and on recreation. However, within the year, a high-powered drive was advanced in New York State to build the Panther Mountain Dam. I have some of the publicity before me and attended some of the public hearings on the project. In each case, one of the arguments offered was that the proposed reservoir would be a boon to recreation, to fish and to wildlife. How it could be and carry on the other functions it was supposed to support and some that were not so blatantly advertised is difficult to understand. It was only through concerted efforts of those who could see in these dams what the aftermath of their construction would be that the measures were defeated, or at least their adoption was postponed. It is hoped they were postponed indefinitely.

A POND WITH FIXED WATER LEVEL IS THE IDEAL.



Billboard Skulduggery Balks Roadside Progress

TAKING some pages from the Communist propaganda book, the outdoor advertising industry is using the technique of "fronts," half-truths and misrepresentation to fight any move that would apply regulation to the industry's right to erect billboards wherever it may choose. Rural highway zoning and the planning of highways as freeways are, in modern thinking, essential to both safe and enjoyable travel. It is these that the industry fears.

Realizing that the rural billboard wins no popularity vote from a considerable and growing segment of the American public, the outdoor advertising industry seeks allies. Just how it gets them does not seem to matter. Some of the methods used, however, present an interesting study in devious public relations.

Back in 1940 the Highway Property Owners Association was started. This was created to reach farmers who rent land for billboards. Every time a legislative threat pops up in a State, a branch of this H.P.O.A. appears.

In 1945 the Roadside Business Association was created, being born at the annual meeting of the American Highway Sign Association. This group is supposed to speak for all types of roadside business; has its headquarters in the office of the counsel of the sign association that gave it birth and pays its bills. Ten of its fourteen officers and directors, including the president and two vice-presidents, are billboard men; three are heavy users of roadside signs; one is a motel owner.

Also created is the Conference of Roadside Business and Property Owners, a front that sponsors meetings and publications. Letters to the address shown on its literature are returned because the Conference apparently has not taken the Post Office Department into its confidence.

Through such fronts as these, the outdoor advertising industry is prepared to move against any roadside control legislation. Letters are gotten out to all businesses warning that proposed laws will ruin them, and presenting biased or distorted versions of any pending bills. Lists of legislators are enclosed and protests solicited. Advertising is carried in trade journals and motel magazines as a follow up.

Recent years have seen a tremendous growth in the motel business. State motel associations have been formed, and whenever they convene a billboard industry representative is on the program to fight zoning legislation. This goes on despite the fact that highway zoning benefits motel operators, most of whom are smart enough to recognize that an attractive motel in pleasing surroundings brings more patrons than one in a billboard-bedizened locale. Zoning also protects the well-planned and well-managed motel from inconsistent and incompatible business invasion.

To quote directly, one misrepresentation to motel owners from the billboard industry says: "The Government is trying to rob you of your livelihood. . .There is a well organized group determined there shall be no business along the highways outside of cities — no motor courts, no highway signs, no gas stations, no roadside restaurants."

Zoning, as a matter of truth, seeks the opposite. The motorist must have all of these facilities, except, of course, the rural billboard. Zoning merely seeks to define business areas, with reduced speed and other safety provisions.

Farmers are told that zoning would confiscate their property; control all buildings within sight of the highway; subordinate everything to esthetic values.

Zoning would have nothing to do with farm buildings, except insofar as it might control the setback of any new buildings in the interests of safety, not esthetics. Indeed, the farmer needs the protection of zoning. Without it he never knows when he will be next door to a beer hall, rural night club, drive-in theater, roller rink, or what-have-you.

Through its fronts the billboard industry claims that zoning and the freeway treatment for highways would place a dictatorship over property owners; fence business off from the highways. Such distortions are endless; some are so ridiculous as to be an affront to the intelligence.

This whole situation is uncovered effectively and factually in the newsletter of the National Roadside Council for December, 1950. Pointing to the real enemies of zoning and freeways, who use the fronts supplied by their own ingenuity to fight regulation of the parasitic rural billboard, the report says:

"The leaders are the same billboard men who offer to our State Highway Commissioners their full cooperation to solve the roadside problems, while they are, in fact, fighting to kill the very methods which the highway department know to be their only solution."

It seems to us that if our highway authorities and planners are going to be able to do the great task that lies before them; if they are going to be able to make highway travel safe and enjoyable, they must be alert to answer the selfish misrepresentations of the outdoor advertising industry wherever its specious case is presented. The American public, which pays uncounted millions for its highways, has a far greater stake in this issue than an industry that seeks to capitalize on this enormous investment, and, unrestrained, to adorn the rural countryside with ranks of billboards.

Conservation Takes to the Air

By EDWARD A. COHEN

Professor Floyd E. Carlson of the New York State College of Forestry at Syracuse University and the members of his youthful panel. Together they bring the dramatic story of conservation to many New York schools.

A SHARP wind swept down from the sky and, once again, the flames fanned out, roaring through and lapping up dry leaves and undergrowth in a broadening arc of destruction. In its wake the fire left the ground hot and black. The forest, only a short time before alive with the clean, fresh odor of vegetation and the soft shuffling of wildlife, was now dead and reeking with the odor of charred and smoking debris.

Almost, it seemed, before the earth could cool, life was already returning — not just the animals that had found shelter from the blaze, but human life. A group of six children, led by a distinguished looking man in a conservative gray suit, appeared. As they approached, the man began pointing to the woods about him—at the dead animals, the erect but lifeless trees, the scorched soil, and finally the concentration of rubble, burnt twigs, matches, and cigarets, telltale marks of a campfire, still smoldering grimly.

Only fifteen minutes after the fire had burst forth, it vanished, and the forest was alive and green again, fresh and clean smelling. And finally the forest, too, disappeared and nothing remained but the six children and the man in the gray suit. They were in no forest, however, but seated around a long table, and the man was saying, "This ends our series on 'The Woods and the Forest Fire.' But next January we invite you to go with us again on the Woodland Wisdom trail, when we shall go out into the snow-covered forest and continue our woodland wisdom hikes."

The magic fire and the magic forest were creations of words and sound effects, courtesy of the Empire State FM School of the Air. "The Woods and the Forest Fire" was one of the many programs in the *Our Natural Resources* series, broadcast over a network of twenty FM stations into thousands of New York State school classrooms to eager audiences of many school children.

The chances are, in this case, that the man in the gray suit was Prof. Floyd E. Carlson of the New York State College of Forestry at Syracuse University, one of the State's conservation experts who contribute to the programs' production.

Although not every phase of conservation is as dramatic as a forest fire, the attempt is to give *every* subject the life that it does not have when read out of a school textbook. Actually the programs are panel discussions among the children and the authority, but the hope is that when the panel dons its "magic mocassins" and heads for the woods, the child in the classroom is right along, taking in the imaginary forest about him. The subject matter runs the gamut of conservation problems — from those of soil erosion through wildlife preservation to forest fire prevention, forest care, and water conservation.

Basically the programs attempt to tutor the classroom student in the ways of Nature, making use of the inherently dramatic medium of radio. If the direct results are a conservation-minded, conservation-acting generation, so much the better. The producers know their limitations, however, and the premise is to build attitudes. or, as Grace Boulton of the Rochester school system says, to "establish habits unknowingly."

"The FM School programs in conservation," asserts Carlson, "are primarily concerned with developing an appreciation of our absolute dependence on natural resources. The fact that in a State like New York nine-tenths of the people live away from the soil and a close knowledge of the natural resources makes it all the more important for urban students to get first-hand information from authorities concerned in meeting and solving the problems of maintaining natural resources."

The Empire State FM School of the Air began opera-

tions in the fall of 1947 with a six-station hook-up. During the winter of 1948, the School invited the State College of Forestry to participate in the programming with a series of conservation broadcasts for the month of March. Under the direction of Carlson, the Woodland Wisdom format was successfully inaugurated.

In the summer a conference was held among officials of the School and several teachers. Suggestions and criticisms were aired and an attempt made to correct the shortcomings of the previous season's broadcasts. Among the more important suggestions acted upon was the use of pre-program information.

Out of this came the "Hints to Teachers," a weekly brochure including the schedule and pointers on pre-program and post-program activity. Thus, the programs, which were meant only as supplementary material to the teacher's curricula, could be prepared for and used more effectively.

A group of conservationist-educators discuss the radio scripts that seek to make young conservationists. Dr. E. Laurence Palmer is at the right.

In one instance the pamphlet suggested, in preparation for a program entitled "The Leaves and the Soil," that the teachers divide the classes into groups of five and assign each group a flowerpot filled with soil and a handful of earthworms.

Then, as the program was broadcast, the children were told to follow the conservationist's instruction and place some dry leaves on the soil, moistening them from time to time. This done, they watched the results. Eventually the earthworms had eaten and dragged the leaves into the soil, and the voice was informing the students that this process adds to the fertility of the earth.

Prior to another program, called "The Cone — Seedhouse for Seedlings," cones were distributed to many of the schools, and the teachers were instructed, by the announcer, to drop the cones in water. In this case the students watched as the cones slowly closed up in the water, and over the radio the expert explained how Nature has provided these plants with this protective device to keep their seeds intact.

In the fall of 1948 the improved series continued, with Dr. E. Laurence Palmer, Professor of Nature and Science Education at Cornell University, and Director of Nature Education of the American Nature Association, cooperating with the College of Forestry on a program.

Since that time, invitations have been extended and readily accepted by many other authorities in the various fields of conservation. Among these experts are Clayton E. Seagears, Director of Conservation Education, New York Conservation Department, Albany; Dr. Arnold Baur, State Soil Conservation Service, Albany; Herbert B. Walker, District Conservationist, Soil Conservation Service, Syracuse; C. A. Gillett, Managing Director, American Forest Products Industries, Inc., Washington, D.C.; Frank A. Connolly, Acting Regional Forester, U.S. Forest Service, Philadelphia.

At a conference, usually held at the College of Forestry, these men, or representatives of their departments, meet to discuss the year's schedule. Also in attendance are members of the boards of education from the network cities and other educators. Subject matter and program format are decided upon and the year's schedule tentatively drawn up.

The programs themselves originate from several sources. Besides the College of Forestry, the U.S. Forest Service and Cornell's Department of Rural Education do broadcasts. At present, plans are being made for the New York State Conservation Department to tape record programs in Albany to be broadcast later over the network.

In addition to the program's expansion in scope, the network has expanded in size. Today there are twenty stations throughout the state that carry Empire State FM School of the Air programs. Seventy-five percent of New York's elementary schools are included in the network's range. Plans are being made to pipe the programs into New York City, which as yet is not included in the broadcasting area.

Exact figures have been difficult to obtain, but an inquiry to the Rochester Board of Education revealed that more than 5000 children in more than 180 classrooms listened to the conservation series last year. It is estimated that this year's audience has at least doubled in size. Best indications of the program's popularity are from the increasing demands for the "Hints to Teachers" pamphlet and overwhelming demands for more radios in the classrooms.

Most schools are admittedly underequipped. In Syracuse only the larger schools have more than one

radio, and in schools with only one, the teacher must do some expert manipulating to get use of the receiver as often as she would like. In Buffalo each school has three radios, but Burton P. Bean, Assistant Superintendent of Schools, asserts that the demand "is not for three radios, but at least six radios for each school."

Here, again, the use of tape recordings is gaining favor as a means of avoiding these physical difficulties. The School of the Air is encouraging schools to purchase tape recording units and make "copies" of the broadcast programs. In this way, if a teacher cannot obtain the radio on the afternoon of a certain broadcast, she can employ the tape recording to present it later.

Reports from some of the teachers themselves indicate vividly the various degrees of the program's effectiveness. One enthusiastic teacher, the type the School encourages heartily, is taking a course in audio-visual education. When the program schedule arrives, she reads up on the subject and briefs the students on it. During the broadcast she attempts to have activities, like the earthworm project mentioned previously. After the program there is a discussion period and, a few days later, she arranges to have a moving picture shown on the same general topic. The results are material. For days afterwards, students bring in newspaper and magazine clippings on the subject, or, in some cases, specimens of the animal or plant life discussed on the program or in the movie.

Many other teachers report similar effects, and some have almost as extensive carry-throughs. All agreed, however, that the programs would not have maximum effectiveness unless the teachers themselves had made sufficient preparation. The School of the Air thus has the dual job of motivating the teachers as well as the students.

Radio-education is not new. Conservation-education of the young is also not a new idea. But neither have materialized enough to fulfill their potentialities.

Radio-education, of course, has been blocked by numerous factors — operating expense, commercial competition, lack of broadcasting bands and other barriers. An extensive campaign to educate the young in conservation has not been launched, either. The "how" has never been completely solved.

The Empire State FM School of the Air and its *Our Natural Resources* series are still new experiments. As yet, they too, have not fulfilled their potentialities. Much improvement in the programs is needed, and more interest is required on the part of the public, before the programs can be considered as saviors of the woods and the watersheds.

But necessity has been the mother of invention for a long time, and, as anyone remotely concerned with conservation knows, there is now a necessity.

And New York State politely reminds us that they laughed at Fulton, too.

The Bird's Nest Plant

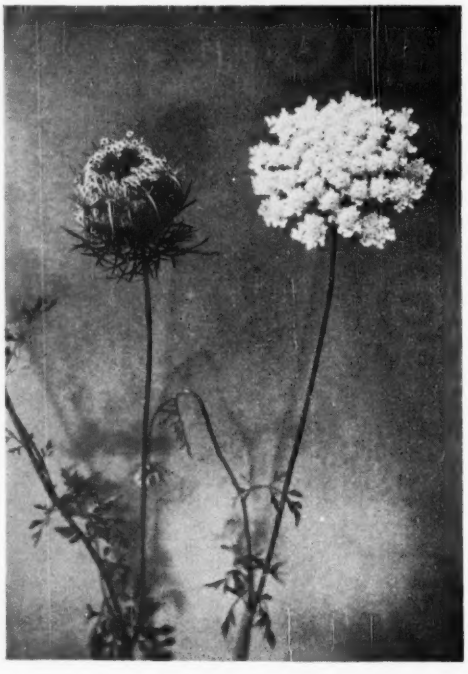
By GLENN R. DOWNING

One rarely stops to admire weeds when on a jaunt for wildflowers, but the wild carrot, or Queen Ann's lace, as it is often called, seldom fails to command attention. It is a widely disseminated, erect, rather bushy, rough biennial, with white, compound umbelliferous flowers. When ripe, the rays of the flowers curve inward toward each other, giving the appearance of a bird's nest.

There is a mystery in the flower cluster itself. In the center is found a dark purple floret on its own stalk, larger than the other white ones. The presence of this darker floret has been unexplained.

One frequently hears that our common garden carrot was derived from this charming weed. Perhaps the true facts cannot be better stated than by quoting Neltje Blanchan in *Nature's Garden*, 1900, who says in substance:

"A common fiction is that the cultivated carrot, introduced to England by the Dutch in Queen Elizabeth's reign, was derived from this wild species. Miller, the celebrated English botanist and gardener, among many others, has disproved this statement by utterly failing again and again to produce an edible vegetable from this wild root. When cultivation of the garden carrot lapses for a few generations, it reverts to the ancestral type—a species quite distinct from *Daucus carota*."



The Pasture

By RUTH M. RASEY

THE pasture has long been our family source book. Its forty-odd acres of berryfield, woodlot and grassy slope spread their wisdom-packed pages upon our southern Vermont hillside, where the silver of the mountain brook illuminates the text.

As Great Grandfather and his neighbors laboriously rolled cobble-heads and boulders out of the earth to fence their newly cleared, adjoining acres, they learned beyond all doubt that good fences make good neighbors. They found, too, as they toiled and yarned and munched their salt pork and johnnycake beneath a tall pine at mid-day, that men become united when they work together to produce what is good for them all.

In the hundred and fifty years that have followed, they and their descendants have kept alive that belief. Each spring they have gone, with ox and stone-boat at first, with extra rails and sharpened posts on horse-drawn wagons for several decades, and with tractor and wire-stretcher in more recent years, to repair the line fence. It is as much a part of the spring ritual as turning the cows to pasture. Each man, walking his side of the line, sovereign of his own stock and domain, but each a part owner in the boundaries that promote their mutual good — boundaries whose maintenance cause their owners to know and understand one another better; boundaries that separate what is best separated, but which permit the free passage of all with a right to pass. The wild gifts are free, for no man's sweat has gone to their growing.

One of the pasture's gifts, which Great Grandfather and all his kin have most generously shared with friend and stranger alike, is found in its medical resources.

When the deadly smallpox struck the sparsely settled hill community one fall early in the 1800's, the young Joseph recalled how his father had successfully handled the dread disease in the pesthouse at his home town of Bennington several years before.

Searching his pasture, he found a patch of lobelia with ripened seeds. These he gathered, to pulverize with mortar and pestle for the needed emetic tea. From beneath the great red oak tree at the farthest corner of his lot he filled his leather bucket with glossy brown acorns. The kernels of these he would pound fine and steep with the goldthreadroot he had gathered the previous May, to relieve the horrible canker. A flint stone, the size of a flat loaf of bread, he carefully drew from his wall. This, heated in the fireplace and drenched with strong vinegar, would produce a curative steam.

Armed with the pasture's wealth, he returned to his sick neighbor's home. In the harrowing weeks that followed, only one of the stricken settlers was carried to his grave.

The men and women of that remote settlement helped one another through many another illness, and Great Grandmother's services were often in demand. Before her own first child was born, she had been gathering red raspberries that grew in the neck of the pasture nearest the house. To relieve her thirst, she chewed some of the dewy green leaves and found that the burning soreness of her mouth and tongue was pleasantly relieved, as if it had been cleansed and sweetened with a magic brush.

When her wooden pail was full of the crimson fruit,

she pinned her brown homespun skirt around her, with spurs from a nearby thornapple tree, and picked a quantity of the raspberry leaves into its folds. These she carried home to her lean-to.

For many years her own and numerous other babies in the community had their first feeding from this berry-leaf tea, mixed with boiled wild honey from the pasture bee tree, and some fresh, warm milk. It proved a preventive for sore mouths, which so often developed in the new babies of olden days.

One of the neighbor women, stiffening with convulsions, was once saved by a brew that Grandmother, fifty years later, concocted in desperation. Into a cupful of the strong, hot raspberry tea she mixed a teaspoonful each of pulverized red pepper, lobelia seed, and yellow ladyslipper root, that her husband had gathered when fixing fence the spring before, for a nervine. Shaking the mixture well in a bottle, she added some boiled wild honey and poured the fiery liquid, little by little, down the sick woman's spasm-constricted throat. Soon, beneath the homespun sweat blanket the sick woman's body relaxed.

The fruit and leaves from that old berry patch have fed and healed six generations of its family and neighbors.

By the time Great Uncle Zachariah had grown to manhood, three tall Balm of Gilead trees were shading the pasture bars, where he called the cows to their milking. Accidentally crushing some of their fallen buds between the top rail and his blistered hand one April evening, he was inspired by their soothing, sticky juice. He and his father and brothers spent all the time that they could spare from picking stone, plowing and harrowing the next few days, experimenting in the big brass sap kettle slung over a fire in the stone arch at the edge of the sugar bush. They finally found that by boiling a bushel of the Balm of Gilead buds in the great kettleful of water from the freshly cleaned and settled pasture spring, until only a gallon remained, straining this mixture through a woolen sheet, and adding a bucketful of hot, newly rendered mutton tallow, also strained, they had a healing salve for man and beast. Many a tin of this kind of salve is in use, even today.

One of our neighbors, Norman Jenks, used to search our woods each summer for the ginseng root, so prized in the China market. It made a nervine tonic for Oriental ills straight from the rich dark mold of the Vermont woods. And from its sales our neighbor satisfied his simple needs through most of his eighty years.

But the pasture has given more than medicine to its several generations of owners and neighbors.

One August day in 1838, Great Uncle Oliver was gathering wild cherries from its fencerows. These he would pulverize and mix with warm water, maple syrup, some scorched Indian meal and a little yeast to make a cooling drink for the men who cradled his father's wheat. Suddenly he realized that the sweet elder bushes growing nearby had the only fruit-bearing branches he had seen that summer free from caterpillars or other insects. "They ought to be good for something to pay fer drying up the cows in blossom time," he meditated. There must be something in their sap.

For many a season thereafter, he successfully whipped green elder leaves against the limbs of his father's, and later his own, choicest pearmain and pound sweet apple trees to prevent insect pests. And an infusion of the elder leaves sprinkled on her yellow and pink rosebuds and clove pinks saved Great Grandmother's flowers from destructive caterpillars for years to come.

The pioneer girls and women used to beautify their homes whenever time and resources permitted. Great Aunt Ruby especially loved color, and from the time she was fourteen, in 1828, she experimented with the dyepot. This black iron kettle stood at the far end of the kitchen hearth, when not bubbling and steaming from the crane over the hot bed of coals in the great brick fireplace. Into this pot went, in separate batches from the pasture, all sorts of barks and twigs and roots, wild grapes and berries, nutgalls and even blossoms to steep into dyes for the flax and wool that fed the humming wheels and loom.

The elm, the sumach and the spruce rendered lovely shades of red; the ash and tender young walnut twigs soft greens; and butternut, alder and oak were best of all for brown. The blues from toadflax and grape, and the yellow from cowslip, goldenrod and adder's tongue blossoms were especially tedious to prepare, for collecting sufficient fruit or blooms was a back-aching job.

The well worn garments, too, were often dyed to be cut and hooked or braided into rugs; rugs to bring a bright touch to the somber rooms.

When Great Aunt Ruby was returning from taking the wood-choppers their mid-forenoon lunch of doughnuts and new cider one fall day, she paused to gaze with delight at the gorgeous foliage of the pasture hills. If only she could keep it with her always. And why not? She gathered great handfuls of the maple, oak and sumach, the birch and elm and woodbine leaves of

Snake and Man

By AUGUST DERLETH

The snake could not believe
what sat here held death in hand;
this was its own sweet land.
It came on noiselessly, with no fear,
and lifted its azure head upon my knee
the better so to see.

Nothing disturbed its natural composure;
it moved its sinuous body on my arm
as if to it the fresh disclosure
of man's identity could bring no harm.

It had its rights and I had mine;
between them was no defining line.
It touched, smelled, put out its tongue.
Oh, young it was, so young
it followed Nature's plan
and trusted still perfidious man.

the brightest hues, and then a clump of the blue, fringed gentian that cupped the azure of the autumn sky in its heart. These she stowed into her plum-colored fascinator and ran excitedly homeward.

Spreading a piece of a heavy, handwoven sheet on one corner of the kitchen floor, she sorted and arranged her leaves and gentians to form an all-over pattern and border on the four-foot-square linen. With a piece of charcoal from the fireplace, she traced around them.

In the long evenings that fall and winter she bent happily over the rug she was hooking. Having selected the desired colors from the chest where the rug rags were kept, she patiently cut countless strips, each from a quarter- to a half-inch in width, and painstakingly filled in her design and background by drawing loops of these through the meshes of the linen with a hook her father had made for her. Bordering the whole with the dark brown of her mother's wedding dress, to represent the tree trunks, she had, by spring, achieved the most beautiful rug ever seen among the Vermont hills.

When she became a bride the following year, this was her best-room rug, and the pasture dyes and design brightened her floor until her children's children romped there. So much admired was it that the pattern was copied by numerous other housewives and by a traveling peddler. Somewhat altered, it is still a popular pattern for rug hooking.

When Aunt Miriam was piecing quilts for her marriage dower, she was inspired to make one of sprigged green calico triangles, set together with white muslin, as a likeness of the tracks of the fox and wild geese, which she had seen fagoting the early autumn snow, when she had helped drive the sheep in from the pasture. Two of her granddaughters still cherish their Fox-and-Geese quilts.

Three generations of dreamy-eyed maidens, too, have stitched their bridal quilts in the pattern of the wild roses that shed their nostalgic fragrance through the velvety June dusk from the gray stone walls. Some of these deftly quilted, red and pink and green and white counterpanes will, no doubt, be handed down for another generation or two, their beauty enhanced by age, for their pasture dyes have neither faded nor "run."

In one of the oldest family quilts, preserved in an attic chest, may be seen a piece from Great Grandmother's first experiment with dyes. As chubby little Harriet trudged along the woods road with her mother in that long ago, she tripped and crushed her tiny apronful of whortleberries, as huckleberries were then called, against her homespun sacque. Great Grandmother's rebuke never found utterance; the stain was an inspiration. Into a steaming kettleful of the rich, dark, berry juice the young mother dipped her little girl's dress. And Aunt Harriet had a royal purple gown; a gown that still gives its beauty to a quaint old quilt block.

In more recent years the great amethyst- and jade-winged luna moths, and the jeweled cecropias, have supplied designs for the local silversmith and ceramic makers, as have also the plume-tailed squirrels and feathery ferns along the wood road.

From the gamboling in the pasture pond, many boys and girls have learned the art of swimming. Balanced on his stomach across a mossy fallen tree trunk at the edge of the water, one could safely imitate the movements of the big bullfrogs until he was proficient enough to splash among the lily pads beside his croaking tutors.

When I was a student at State Teachers' College, memories of my sister and myself imitating my father and brothers at work in the woodlot, saved me from disgrace. I had badly bungled my first demonstration in teaching physical education.

"Stiff!" and "Dead!" echoed among the class critics, as I perspired to the finish of a book exercise. But they gave me a second chance a few days later.

When my thirty-odd critical classmates had finished a ten-minute workout with an imaginary crosscut saw, a tough old elm, and a pile of cordwood, they were red-faced and breathless with exertion and laughter. My turn to hurl, "Stiff!" and "Dead!"

The family genealogy notes that Great Great Aunt Pamela, who passed to her reward at the age of ninety-seven, was "a devout Christian, greatly beloved by all who knew her." When she was nineteen, she came to visit her brother and sister-in-law, Joseph and Vesta, at their new homestead. One afternoon she spent with Brother Abel's family, and on the way home at twilight, missed the short cut through the pasture woods.

Somewhat after dark, she reached Great Grandfather's, with an exciting experience to relate. Half way through the woods, she had suddenly felt a cold nose close to her arm and a great hairy body padding along beside her. According to the prevalent belief of those days, she thought that this was Satan, come in the form of a wild animal, to tempt her to forsake her faith in God and His constant care for His followers. Now Pamela loved her family, her neighbors, and most of all, her Maker. Her conscience assured her that she had committed no evil in thought or deed, and so, secure in her belief that "Love casteth out all fear," she kept calmly on her way. Sure enough, at the pasture bars, where Great Grandmother's candle could be seen shining across the clearing, Satan disappeared.

When Pamela finished her tale, Great Grandfather reached for his flintlock and strode into the night. A half hour later he returned.

"Judging from the track at the barway, your Satan was the big black painter (old form for panther) that's been killing sheep around here all summer. The only reason he didn't make an end of ye was because ye didn't run nor act afeared," he concluded grimly.

Aunt Pamela gently replied, "Fear is Satan." Her brother merely grunted as he put his gun back on its hooks on the kitchen rafter.

More than a hundred years later, one of my cousins was blueberrying in the same pasture, when a young bull approached her, bellowing and pawing the dirt as he slowly advanced. Ann (Continued on page 164)

Avalanche is a good white 'mum, tall-growing and blooming in early September.

September Bronze is a bronze and gold chrysanthemum of early September.

Golden Gifts From the Far East

By ANDREW S. WING

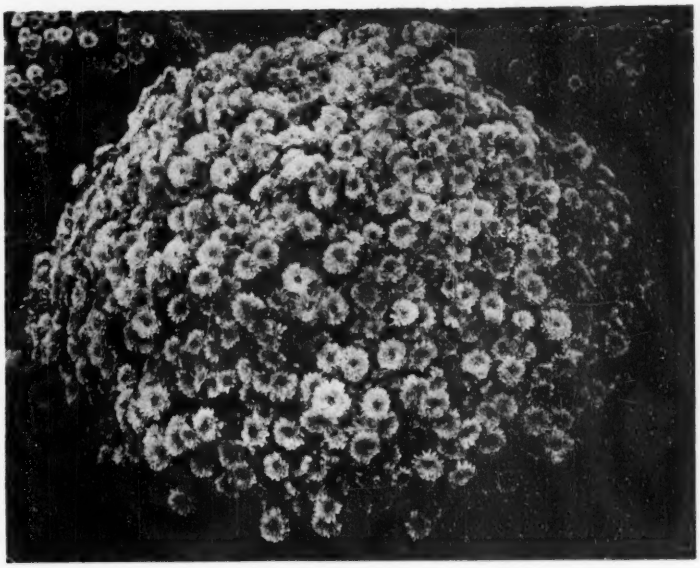
Photographs from J. Horace McFarland

CHRYSANTHEMUM comes from the Greek and means "golden flower." The name is a happy choice, for while there are several colors and many shades in this great plant group, the golden and bronze ones are perhaps familiar to most people. Although there are more than 150 species, and thousands of cultivated varieties, there are just two groups that are commonly seen — those that will grow outdoors, and the fancy ones that fill the florists' window in autumn. In this family, too, are flowers that we do not usually regard as "mums," such as Shasta daisies, pyrethrums or painted daisies, feverfew, Marguerites or Paris daisies, and the Dalmatian sort from which the pyrethrum insect powder is derived.

It is, however, to the outdoor varieties that most of us look for a blaze of autumn glory. The chrysanthemum is the flower of the East, just as the rose is the flower of the West, but in this case the twain *do* meet, for, after the rose, the mum ranks high among our most popular flowers. The mum craze hit America about 1888, when a single new introduction of the Ostrich Plume, or Japanese Hairy type, sold for $1500, a considerable sum for a flower, even in these days. This was strictly an indoor type, of course, suited only for use by fanciers. But in 1888 there were not many varieties that were truly hardy outdoors in a northern climate, and those few were more rugged than beautiful.

The cultivation of chrysanthemums started in China so long ago that their origins are shrouded in mystery. Probably at least three wild species were crossed, accidentally or purposely, and the small, simple, single species, mostly whites and yellows, gradually were transformed into the large doubles and the elaborate forms that we have today. Confucius wrote, about 500 B.C., of "the chrysanthemum in its golden glory." He was a gardener as well as a philosopher, and grew the plants in his own garden. About a thousand years later the Japanese are said to have imported mum seeds from Korea, where hardy species grew wild, but these may well have been varieties already improved by the Chinese. At any rate, the Japanese developed and refined the flower to its highest standards up to that time, and, in 910 A.D., the Emperor made it the national flower of Japan and held an exhibition of chrysanthemums in the Imperial Palace.

Early plant explorers and traders brought the chrysanthemum to Europe, and in 1688 a Dutch plantsman, Jacob Breynius, wrote of red, white, purple, yellow and flesh-colored varieties that he had grown in his own garden. The English first grew mums in 1764, but it was not until thirty years later that the flower took root in the British Isles. Because of the mild English climate, sorts that are rather tender can be grown outdoors, but the finer varieties were those that required



One of the cushion chrysanthemums, Golden Cushion makes a fine display in mass of bloom.

greenhouse culture.

Probably chrysanthemums were introduced into America in colonial times, but it was not until the middle 1800's that they were grown to any extent, and then mostly by those whose means permitted the use of greenhouses or some winter protection. The mums that did survive outdoors were the old-fashioned doubles of medium size, which used to grow in grandmother's garden. Many will recall the rather tall, floppy kind, usually white, yellow or red, that bloomed about Thanksgiving time. If a real stiff frost threatened before these old favorites were through blooming, grandma would go out before dark and cover them up snugly, preferably with an old red flannel petticoat.

The chrysanthemum remained a rather fussy flower, on the whole, until this century. That is to say, those who lived north of the Mason-Dixon line, or any place where cold winters prevailed, either had to have a greenhouse or move the plants into cold frames in winter, or else grow the less refined, ragematag members of the family. One could, of course, buy from a florist a potted plant in full bloom and keep it until it faded, and then hopefully set it out in the open ground, but the result was usually a funeral rather than a birthday celebration the following year. Now we have, thanks to the good sense and initiative of a Connecticut Yankee, and, in his footsteps, a score or so of mum enthusiasts, a lot of varieties that are as fine as those grown indoors, and which will survive most northern winters. Of course, there are those sticklers for veracity such as the Sidney Huttons of Conrad and Pyle at West Grove, Pa., who will tell you that there are no good mums that are absolutely winterproof. The Huttons, father and son, are doing fine work with mums, and their newer varieties are as fine and as hardy as any, but one feels they rather lean backward in their conservatism. Actually the new outdoor mums are hardy, most winters, and if they get caught once in a while by a bad spell of weather, who is going to complain too much?

The Connecticut Yankee mentioned above was the late Alex Cumming, whose hilltop nursery at Bristol suited mums well in summer, but gave them a real tough time in winter. Being a mum fan, he decided to breed hardiness into the beautiful strains that we had inherited from Japanese, English and other plant breeders. Being a man of imagination and ingenuity, Alex Cumming had an idea that if he went back to the original species for hardiness, he might get what everyone had been looking for. So he obtained seeds from Korea and crossed these with the beautiful but tender varieties that other breeders had been nursing along. Why, in some 2500 years of mum culture, no one else had hit on this obvious idea is an interesting question. But the fact remains that Mr. Cumming hit the bullseye as to hardiness, and beauty, too, so all that remained from then on was for other breeders to try different crosses and combinations until the present lovely and hardy varieties came into being. And so it came about that the little Cinderella flower of the Korean hills, from which so many of our lovely plants have come, became the parent of a new race of mums known as the Korean hybrids.

There was another hardy strain that is becoming popular as new hybrids are introduced. This is *C. arcticum*, a single, daisylike flower that will stand all kinds of weather since it hails from the far North. It is pretty, too, to those who like single flowers, and comes in shades of rose, yellow, bronze, and white, all with yellow centers. Bees love to visit this modest little flower in late autumn, and while it is scorned by fanciers of the bigger and more showy mums, it is worth having in any garden. It can be grown from seed quite easily and you may get some interesting variations in the flowers if you try this method of propagation.

When it comes to types and varieties of mums, the field is wide open. The greenhouse varieties include the formal, long-stemmed sorts with the big blooms such as we used to give our girls at football games.

There are also dozens of other handsome hothouse types, such as spider mums, feathery flowers, and those with large centers. As table decorations, potted or in vases, these are unsurpassed around Thanksgiving time. But they are utterly unsuited for outdoor planting. In the outdoor group one finds a wide variation, starting with the cushion or "azaleamum" types, which have many small flowers spread out on short stems. These are fine for masses of color in a border, or for other landscape effects, especially on a dry hillside. Some of these will start blooming in late July and will continue until late September. In recent years the range of colors has been increased from the original pink to yellows, bronzes, reds and white. If no other mums were to be planted, I think I would choose several of these. However, they are not good for cutting, and for close-up effects and as individual specimens they cannot compare with some of the taller, larger-flowered varieties.

Satisfactory for general use, also, are the pompon varieties. Individual flowers may be no larger than a button, but they are profusely borne on branched stems and, with their clear colors, make a good mass effect, either outdoors or in a vase. There is a wide variation in color, size and form, and the trend at present is towards the larger sizes, some of which approach or even surpass the tender varieties in size, form and color.

To appreciate the refinement and versatility of the modern chrysanthemum one needs only to go to the nearest flower show, or to visit a nursery or botanical garden that specializes in this loveliest of autumn offerings. Indeed, the lowly mum has gone a long way since the days of Confucius, or even since the more recent years when Alex Cumming and his followers decided it was about time to streamline the flower and put it into competition with the peony, iris, rose and other hardy garden plants.

In thinking of chrysanthemums one should not overlook the other members of the tribe, including the Shasta daisy and the annual varieties. All of these have their place in the garden, but for hardiness, color and general adaptability, the new outdoor strains remain supreme. A daisy is a daisy and all right in its place, but it is not a chrysanthemum to most of us, even if it is a member of the same plant family.

To grow hardy chrysanthemums successfully is easy if certain simple principles are followed. They will grow in almost any soil, from light sand to heavy clay, if it is well-drained and fertile. Mums like elbowroom and they resent having wet feet. So do most plants, for that matter, but mums are greedier than most and they appreciate a little consideration in that respect, although not fussy in other ways.

Planting can be done either in spring or fall. Spring is better because small plants or rooted cuttings can be bought then at reasonable cost (about three for a dollar). These will grow into sizable clumps by blooming time. Blooming or budded clumps may be purchased in the fall in burlap bags, and they will go right on blooming as though they had not been moved. You have the advantage, too, of being able to see what the flowers look like and the height of the plants. However, you will pay two or three times as much for clumps as for small plants, and they will require dividing the following spring. Most gardeners will prefer to buy the smaller plants in early spring, thus getting more for their money. Choose your varieties from color illustrations in the catalogs, or by orders placed the previous fall with a nursery or a display garden.

Feeding the plants will not be necessary during early summer if the soil is fertile at time of planting. Manure if well rotted, is good, or a complete plant food such as 5-10-5. Towards the end of summer, a little extra feeding is advisable to stimulate growth and bud development. If the weather is dry, soak the ground thoroughly, but do not sprinkle often, for this may encourage fungous diseases.

Tall varieties should be staked before they start to bend over, not afterwards. Pinch back tops of plants several times to make the plants bushy, but not after the buds begin to form. Disbudding along the stems is practiced to encourage the top buds to grow to large size, but is not necessary with the garden varieties. Nor is it necessary to pinch back the low cushion mums as they are naturally bushy in habit.

Attacks by insects or plant diseases are not likely to be serious if the plants are well grown and not crowded. However, it is a good idea to spray or dust them anyway when roses or other plants are being treated. The usual insecticides and fungicides, such as rotenone, nicotine and Bordeaux mixture, will usually suffice.

After blooming, cut the plants back to six-inch stems, and in colder regions apply a mulch as soon as the ground is frozen. Hemlock or other evergreen boughs are good, if mixed with a few leaves, straw, or salt hay. A heavy coating of leaves alone is not recommended, however, as these are likely to become a wet, soggy mass. Do not remove the mulch in spring until the weather becomes really warm and there is no further danger of freezing.

Divide up your clumps every two or three years, or as often as they become crowded with old dead wood in the center. If you will follow the above simple rules, you can plant mums with the assurance that they will be with you and bloom merrily for years, barring accidents and freaks of weather. But be sure to pick the right sorts to begin with.

As this is written I have just returned from the annual exhibition of the National Chrysanthemum Society at the New York Botanical Garden. Here was the greatest display of both hardy and indoor types that I have ever seen, and I have visited many chrysanthemum shows. The outdoor plantings were at their peak, and, following our first severe frost, offered an excellent opportunity to compare the hardiness as well as beauty of several hundred varieties, including many that were just introduced or still on trial, as well as standard sorts. One would have to see such a show to believe it, for with most of the leaves (Continued on page 159)

To Gad or Not to Gad

By MURIEL L. GUBERLET

IT IS tremendously difficult to find the happy medium in the matter of gadding. Either we rush frantically on shopping tours, to club meetings, or to parties; or we stay at home week in and week out, content to read, to putter in the garden, or to tend babies. The burning question is: "To gad or not to gad."

Seashore animals, like human beings, have the choice to make. Barnacles, for example, stay at home year after year. While the shrimps dart hither and yon continually, even sleeping and eating on the run, or rather on the swim.

The jellyfish have worked out an interesting solution to the problem. They compromise. One generation fritters away its life on the watery highways; the next generation stays at home from birth to death. In fact both the appearance and the way of life of jellyfish parents and children are so different we would never dream that they had anything in common. They even have different names.

One generation is called a hydroid, and lives all its life on a wharf piling or a rock, where it looks like a plant. The next generation is a gallivanting jellyfish. Impossible, it seems! However, if we would observe the hydroid colony under a microscope, we would see a tiny opening at the end of each branch. A few days later a circle of tentacles develops around the opening. The opening has now become the mouth of a tiny animal, and as the tentacles move back and forth in the water, they force food particles into the mouth. In the course of time the little chap perched on the end of the branch breaks off from the parent hydroid and swims away. It has cut itself off completely from the stodgy life of the hydroid and has become a full-fledged jellyfish.

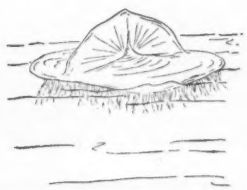
The tentacles of a jellyfish trail behind, gathering food.

It pays for its revolt by being forced to wander for the rest of its days, an animal without a country, so to speak. Back and forth and round and round it goes without rest and without repose. In fact the movement of the jellyfish is regular and rhythmic like the beating of the human heart, and while there is life there is movement.

But the jellyfish cannot stand the pace for long. It soon becomes tired and dies at the end of one season. Even though the jellyfish's life is brief, it has lots of fun. "Eat, drink, and be merry for tomorrow we die," is its philosophy. Before it dies, however, it sees the error of its ways and resolves that its children will have the rest and quiet it was denied. Therefore, the jellyfish deposits eggs in the water. These develop into hydroids. Once more the cycle moves through its preordained course. The hydroids produce free-swimming jellyfish and the jellyfish produce hydroids, generation after generation, world without end.

At the end of a hydroid branch a jellyfish develops

Doctor William Beebe, in speaking of this relationship, says, "It would be no more strange for a cat to produce geraniums instead of kittens and for geraniums to produce kittens instead of seeds, than it is for a hydroid to produce jellyfish and vice versa." Without doubt this is one of the strangest phenomena in the animal world. It is called alternation of generations.

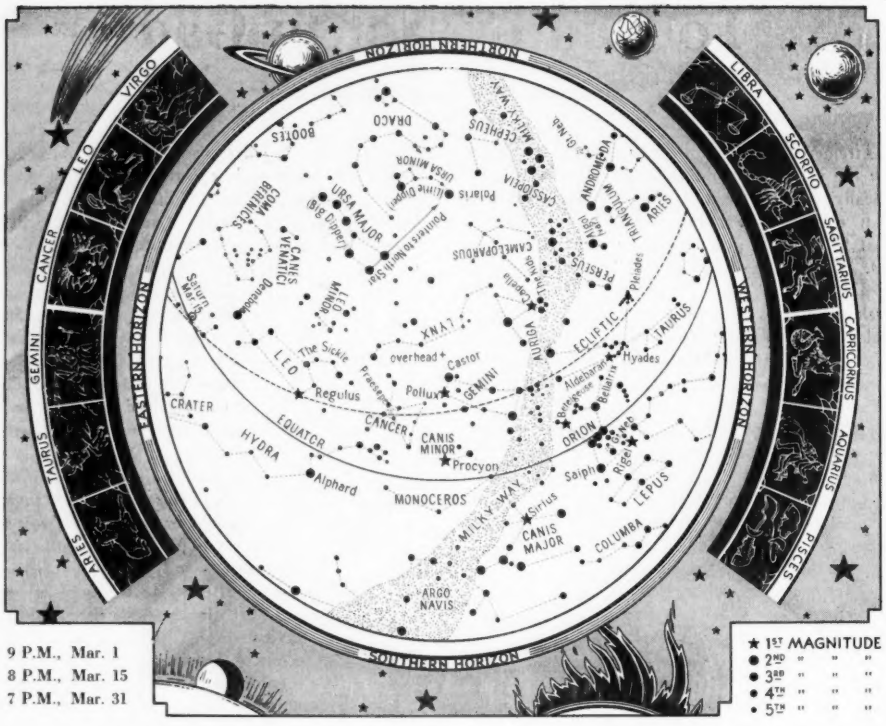


Some jellyfish look like paper sailboats.

To us casual observers, a jellyfish appears as a splotch of jelly drifting with the tides, but within that shapeless mass are all the requirements of a successful life. It moves, takes in food, gives off waste, carries on respiration, and reproduces itself. These are the fundamental functions of all life, be it man or jellyfish.

Even more remarkable is the fact that a jellyfish's body is composed of 95 percent water and only 5 percent of the stuff of which life is made. Like Shakespeare's description of old age, the jellyfish is "sans teeth, sans eyes, sans taste, sans everything." In addition a jellyfish is sans arms and legs. We would expect the absence of arms and legs to be a handicap to an animal doomed to spend its life swimming. But since the tissues of the jellyfish contain large quantities of water, the jellyfish is nearly the weight of the water, and it is easy for it to keep afloat by propelling itself forward by opening and closing its bell-shaped body.

Using this unusual style of propulsion, hundreds of species of jellyfish move through the waters of the world. Some have brilliant red, orange, or azure hues; others are scarcely distinguishable from the waters in which they swim. Some have discs seven feet in diameter with tentacles one hundred feet long; others are too small to be seen with the naked eye. Some glide on the water like paper sail- (Continued on page 163)



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

The Galaxies in Cancer

By ISABEL M. LEWIS

THE zodiacal constellation of Cancer, lying between Gemini on the west and Leo on the east, is one of the most inconspicuous constellations in the heavens. It is in Cancer, however, that work with the 48-inch Schmidt telescope on Palomar Mountain has yielded some preliminary data of great interest regarding a great cluster of Galaxies in this direction and at distances of about 30 million light years.

According to Hubble and Humason, in investigations made nearly twenty years ago, this great cluster in Cancer consisted of 150 galaxies covering an area of about one square degree, or about four times that covered by the full moon. So faint are the individual members of the cluster that only the largest telescopes will show them clearly. When the great Schmidt telescope was used to investigate this and other galaxies at great distances, it was found that their dimensions were much greater than formerly suspected. The recent work of Zwicky with this telescope shows the existence of 300 galaxies in this great cluster in Cancer, with photographic magnitudes between 13.8 and 18. The cluster has a spherical distribution of members in which the more massive galaxies tend to concentrate toward the center, while the fainter galaxies and the less massive remain on the outskirts. When one considers that a single galaxy is a vast system of stars like our own galaxy, although in many instances considerably smaller, this great assemblage of galaxies in this one region must consist of countless billions of stars, many of them suns far superior to our own sun in size and splendor.

It was during the period of testing of the Schmidt telescope that several photographs of the Cancer cluster were obtained by Zwicky, and to date these are the best obtained, although considered by him to be by no means the best that can be obtained with that remarkably fine instrument. The telescope is no longer avail-

able for detailed work on galaxies as it is being used in the general survey of the heavens that has been undertaken jointly by The National Geographic Society and The Mt. Wilson and Palomar Observatories.

The constellation of Cancer contains, besides this remarkable cluster of galaxies far exterior to our own galactic system, an interesting nearby object, comparatively speaking, a member of our own galactic system. It is known as Praesepe, or The Bee-hive. It lies nearly in the center of the constellation within a small configuration, a four-sided figure outlined by two fourth-magnitude stars and two fainter stars, and it appears without telescopic aid as a faintly luminous patch. Even binoculars will resolve this object into a coarse cluster of stars known as an open star cluster. It is at a distance of about 600 light years from the earth, and is the most distant of several other clusters of the same type now visible in the evening sky. The Hyades and The Pleiades in Taurus, now in the western evening sky, are also moving star clusters as well as Coma Berenices, (Berenice's Hair), which lies north of Virgo and south of Canes Venatici, The Hunting Dogs, under the handle of The Big Dipper. Coma Berenices is, in itself, a constellation. Its hazy appearance is due to the large number of stars in the group just beyond the limit of visibility to the unaided eye. In addition to Praesepe and the cluster of galaxies in Cancer, there is also another loose cluster of about 200 stars, mostly of 9th and 10th magnitudes, several degrees southeast of Praesepe. It is a fine object in a small telescope.

Many centuries ago the sun was in the constellation of Cancer, when farthest north, instead of in Gemini, where it is now to be found when it reaches the point farthest north at the beginning of summer. At that time its distance from the equator changes very little for a few days, and the slow, sideways motion of the crab was supposed to be descriptive of this slow motion of the sun in declination at the time it was in this constellation and farthest north at the time of the summer solstice. The Tropics of Cancer and of Capricorn also were named for the two constellations in which, many centuries ago, the sun was to be found at the times of the summer and winter solstices respectively. It is when the sun is farthest north that it passes directly overhead at the Tropic of Cancer, and when farthest south that it passes directly overhead at the Tropic of Capricorn.

One of the two eclipses of 1951 will occur this month. On March 7 there will be an annular eclipse of the sun. The annular phase of the eclipse, which occurs when the moon shuts off all the light from the sun, except for a thin ring or annulus surrounding the dark disk of the moon, will be visible within a narrow path. This extends from a point in the Pacific Ocean between Australia and South Island in New Zealand, across that island and then across the Pacific Ocean, touching no land except Pitcairn Island until it touches the coast of Nicaragua in Central America, in the late afternoon. It will leave the earth at sunset in the Caribbean Sea. The sun will rise more or less eclipsed on the eastern coast of Australia and in New Zealand, and partial phases of the eclipse will be visible in Antarctica and the South Pacific, and, in the late afternoon or at sunset, over all of South America except the southern and eastern part, all of Central America and the West Indies, and all of the southern, central, and eastern part of the United States. The northern limit of the eclipse region will cross the United States diagonally from southern California to the shores of Lake Michigan, Lake Huron, and the St. Lawrence River, where the eclipse will end at sunset. The magnitude of the eclipse in the United States will be greatest in Florida and Texas. In Panama the greatest eclipse will occur at 5:35 P.M., Eastern Time, and 88 hundredths of the sun's diameter will be covered by the moon at that time. At Washington, D.C., the greatest eclipse will occur at 5:44 P.M., Eastern Time, and the magnitude will be 22 hundredths. The time of greatest eclipse at all places keeping Eastern Time will not differ more than a minute or so from the time for Washington, although the magnitude of the eclipse will decrease toward the north and increase as one goes south. In the central states the middle of the eclipse will occur about an hour earlier.

In the eastern states, from North Carolina to Maine, the sun will set more or less partially eclipsed. The annular phase of this eclipse in Nicaragua and in the Caribbean will last for about one and one-half minutes at the most. Unlike total solar eclipses, which average three or four minutes in length and can never last more than seven and one-half minutes, annular eclipses may vary in length from a fraction of a second, even becoming total in part of the path when the duration is very short, to more than twenty minutes. Long durations of the annular phase occur when the sun is nearest the earth and at the same time that the moon is farthest from the earth. At such times the apparent size of the sun is greatest and that of the moon is smallest. As a result a large ring, or annulus, of the sun is left uncovered by the moon. It is unfortunate that, for scientific purposes, annular eclipses lack the unusual scientific value of total solar eclipses since in general they last much longer. Many additional scientific uses are now being found for eclipses, however, in a study of the atmosphere of the earth and in other ways, so that the observation of annular eclipses is becoming of more importance than it was some years ago.

There are each year eclipse seasons, separated by intervals of six months, when, and only when, eclipses can occur. They are not fixed (Continued on page 163)

Forerunner

By RAY ROMINE

The stars of wintertime are cold
Iced points of pure disdain,
While those of March blow overbold,
And April's foretell rain.
But lo — the skies of this newcomer:
The stars of Maytime promise summer.

The School Page

By E. LAURENCE PALMER

Professor of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

WATER LEVELS, OUT OF SCHOOL AND IN

ANYONE who contends that youngsters are not interested in water levels, out of school and in, has just not watched what they do in the slush or water-filled gutters of the nation whenever opportunity offers. They risk their health by getting wet for the sake of saving some little snow or mud dam they have erected. They join forces with other youngsters to match their skill and strength against the stream. They persist in their interest in the stream in spite of parental or school authority, and, without inducement, return to it at the first opportunity. Getting some education from a gutter need not be wholly disgraceful.

If you have a memory you must remember the dams you made in roadside ditches. You watched how, as the dam was built higher, more area was flooded, and when it finally broke you may have watched with interest not only the damage caused at the point of rupture, but the way in which water was drained from the snow or mud upstream. You may have noted how floating material that had come down stream found itself stranded back from the stream bed with the sudden lowering of the water level, and you may have noticed how the breaking of a little dam upstream may have brought down a sudden flood that may have assisted in breaking bigger dams downstream, barriers that ordinarily might have stood the test. In short, you can remember, see or demonstrate in any stream, natural or unnatural, what happens to water levels when dams stop, or do not stop, the flowing of water.

The cartoon-diagrams in the insert on pages 137 to 144 in this issue of *Nature Magazine* suggest at least four types of water-levels the significance of which may be explored and in part appreciated by any school child. If some permanent pond is available for study, in contrast with some reservoir in which the water level varies greatly, then the contrasts may be obvious. However, if only one of these types is available then it would seem that most children would have enough imagination to appreciate what would happen if the water-level was different. If the permanent pond is available let them report on what they find at the water's edge. Let them, if they have a chance, find a pheasant nest or a duck's nest and suggest what would happen to the eggs or young if the water-level rose or fell. Some of the youngsters may have the good fortune to see a grebe's nest, and to observe how helpless grebes are out of water. What would happen to young grebes if the water level near their nest retreated greatly?

Children may not be able to observe, without help, the nesting habits of fish, although a sunfish nest is most conspicuous once it has been pointed out. They can, however, observe the nature of vegetation that normally is to be found bordering a permanent and a variable body of water. They should be able to recognize that there is a close relationship between the presence of animals and the presence of plants, and so, even though they cannot see the whole story, they may get a start at appreciating the situation by simply observing the effect of water-levels on bordering plants.

It may be worth while suggesting that children be given some appreciation of how certain kinds of animals continue to be abundant, that they understand that no species can long survive on the earth unless it can rear, with some regularity, succeeding generations of young. With this idea in mind, then, let them survey some of the circumstances that interrupt the normal survival of a season's crop of young. They will see that some young families may be destroyed by creatures that eat the eggs or kill the young. *This they may resent.* They may notice that some young fail to reach maturity because they do not have suitable food. This they may sometimes help, in part. You know how anxious youngsters are to help young robins, for example, to reach a point of independence. They may recognize that a late spring or early summer fire may sweep through a nesting area and obviously wipe out a generation of young. They may lend a hand in preventing and controlling some such fires. All of these agencies of destroying young are dynamic and obvious, but the changing water-level may not be so significant to them, and yet it may cause more wholesale destruction than all other agencies combined. Little birds must eat and drink to survive and grow up. They cannot do this if food and water are not present. Little fishes must have sufficient and suitable water to survive. They cannot do this if water vanishes from their breeding area. And so the story goes — water present or water absent makes or breaks the prosperity of many living things, including man.

Since many persons will be asked to help make decisions about the erection of new dams that control water levels, it might be worth while for some youngsters now and then to carry back to their homes some convictions about water levels that may come to them through their school experience. Teachers can help modify these conclusions. The special insert in this magazine may help modify the teacher's understanding of the problem.

Of course, we do not fail to appreciate that there are many values, as well as many dangers, associated with artificially modifying the water-level attained by a stream. Neither have we any wish to condition persons against the values of any worthy contribution such modification makes to human happiness. We may feel that the erection of power dams affects adversely the prosperity of wildlife, including fishes, that it makes unpleasant shorelines for cottagers, and that it may create a menace should the dam go out, but we are dependent on hydraulic power and on electricity generated by water power. Telephones, electric light and heat, transportation by trolleys, pumping done by electric power, and many other activities trace their source of energy to a dammed waterway. Without this our everyday life would be very different.

On my family farm my grandfather used to exercise his bull, and even use the sheepdog, to generate power to churn the milk to get butter. Now power comes in on a wire, and the bull that fertilizes the cows lives far across the State, and gets his exercise by being led around in a circle by a power-driven machine. The water on my grandfather's farm used to be pumped by my grandfather, by his hired man, and, sometimes, by me, but now it is pumped by electricity generated by water power. This may suggest a whole series of interesting surveys of local activities of the present, and of the past, to lead to a fair appreciation of our dependence on water power. We hope, however, that we are not carried away by the idea so much that we fail to recognize what we sacrifice for what we gain. It is for this purpose in part that the special insert was written.

It would be futile for me to try to outline specific problems for your school. You should know them better than I, but I am sure that wherever you live your daily happiness is affected somewhere by water-level. Even a large city that isolates itself from the rest of the world through conceit, possibly, in its own importance, must drink water, must use water for sanitary purposes, and uses water-power extensively. It is absolutely dependent on water being available at all times of the year, and this demands a reservoir. Periodically the city may be flooded, and this may demand a different kind of reservoir. The inhabitants of the city seek recreation in a natural environment, and that often involves standing surface water. It might be well for you and your students to try to realize how dependent you are on water levels, and how that dependence is being met.

GOLDEN GIFTS FROM THE FAR EAST

(Continued from page 154)

gone from the trees, here was an oasis of color that was truly breathtaking. Indoors it was the same, but in a more artificial environment it was harder to differentiate between the hardy and the indoor types of mums.

Old paintings on silk from Japan, and modern pictures on paper, silk and china, added atmosphere, color and background to one of the most outstanding flower shows of the year. I came home from the show with the impression that the average home gardener does not realize the possibilities of this wonderful flower outdoors or for indoor use in pots, vases or flower arrangements.

The following are true and tried and therefore safe, but there are many other handsome varieties. They have been chosen for hardiness, beauty and general adaptability from test grounds at the New York Botanical Garden, from lists in leading nursery catalogs, and from recommendations by leading garden authorities. Naturally, everyone has his likes and preferences in flowers, so see them yourself before ordering if you possibly can.

Here are just a few out of dozens that impress me as being outstanding:

CUSHION MUMS — *Apricot Glow* — Bronze, very early, large flowers. *Lavendar Lassie* — Early and dependable. *Prince Cushion* — Golden yellow, low, double, vigorous. *September Bronze* — Bronze and gold, early September, frost resistant. *September Cloud* — Choice white, continuous bloomer.

TALL AND LARGE VARIETIES — *Avalanche* — Good white, early September. *Aviator* — Reddish bronze. *Autumn Lights* — Bronze Double. *Celebrity* — Large whorls, flowers, rusty bronze, unusual. *Elsie* — Tall yellow, 3½-inch, single blooms. *Canary Spoon* — Large, yellow flower, interesting. *Claudette* — Apricot pompon, very handsome. *Gov. Duff* — Orange bronze, large pompon, late September. *Princess Marie* — Large, coppery pink, handsome. *Success* — Large flowering, rich red, new. *Swallow* — White, cactus, new unusual. *Minnehaha* — Small red flowers but good.

NORTHLAND DAISIES — Daisylike plants that spread and are very hardy. Flowers small, but single and showy in late autumn. Colors range from white to pink, red, yellow and bronze.

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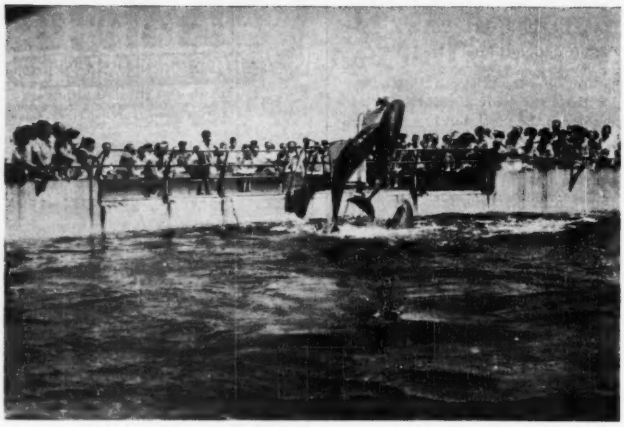
Camera Trails

By
EDNA HOFFMAN EVANS



Two porpoises take to the air at Marine Studios, while two others show a less active interest in food during the feeding session. A shutter speed of 1/500 is sufficient to stop motion.

THIS month completes the fifth year in which I have conducted "Camera Trails." That means this is the fiftieth time I have inserted a fresh sheet of paper into my typewriter and written "Camera Trails" in the upper right hand corner.

Fifty articles about photography subjects, averaging about 1500 words each, makes a total of 75,000 words — the equivalent of a full-length book. But, as every photography fan knows, volumes, shelves, whole libraries can be filled with photographic lore, experiences, discussions, and know-how. Still the field would be wide open.

In preparing "Camera Trails" for the past five years, I have tried to present material that will interest beginners, advanced amateurs, and even those beyond amateur standing. I have tried to deal with all ranges of equipment, from the inexpensive fixed-focus camera to the numerous lenses, filters, and what-nots that come out of an ardent photo-fan's well-stocked gadget bag.

I have tried to avoid repetition without losing sight of the always-important basic essentials, without which the most elaborate and expensive equipment will produce nothing but meaningless blurs. Holding the camera steady, gauging correctly the light, the exposure, and the shutter speed — these basic essentials play vital roles in good photography. So does artistic and pleasing composition.

I have tried to cover a representative area of this western hemisphere, so as to avoid excessive localism. Granted, there are still important regions of the nation and the hemisphere that I have not visited — with or without camera — I have seen, photographed, and written about the territory that stretches from Florida to California, from the Appalachians to the Rockies, from the Everglades to those vestiges that still remain of the once "Great American Desert."

Among the national parks and monuments mentioned in the past five years are White Sands, Rocky Mountain, Fort Jefferson on the Dry Tortugas, Great Smoky Mountains, Chiricahua, Grand Canyon, Petrified Forest, Everglades, plus some others — such as Carlsbad Caverns — which are interesting but which did not intrigue me photographically.

Outside the U.S.A. I have visited and written about Mexico and three countries in South America. There also have been "Camera Trails" sections dealing with photography in the zoo and in the museum.

Always I have kept in mind the fact that my readers are particularly interested in Nature and Nature photography. They want to preserve on film the birds, mammals, reptiles, insects, and marine life that they see and enjoy, whether said subjects are backyard visitors or denizens of the deepest and remotest wilds. Accordingly, I have written about various birds and the problems related to photographing them in many locations and activities. I have written about dogs, cats, cows, and horses from the domestic scene, and about squirrels, chipmunks, deer, lizards, grasshoppers, toads, snakes, turtles, and I cannot remember what else from the wilds.

I have written about clouds, and skies, and sunsets. About trees and bushes, about toadstools and mushrooms, about garden flowers and wild flowers, about cactuses and water lilies. In fact, where Shakespeare found "books in running brooks, Sermons in stones, and good in everything," I have found the same for "Camera Trails."

Looking back and examining closely, it seems that I have rather slighted one branch of the animal kingdom, one that lends itself rather well to photography. I am speaking about the realm of fish. The finny world of gills and scales has been slighted. Accordingly, I am going to remedy the oversight immediately, in this and in the "Camera Trails" section for next month. This time I am going to discuss techniques of fish photography in a public aquarium. Next month we will talk about fish photography at home.

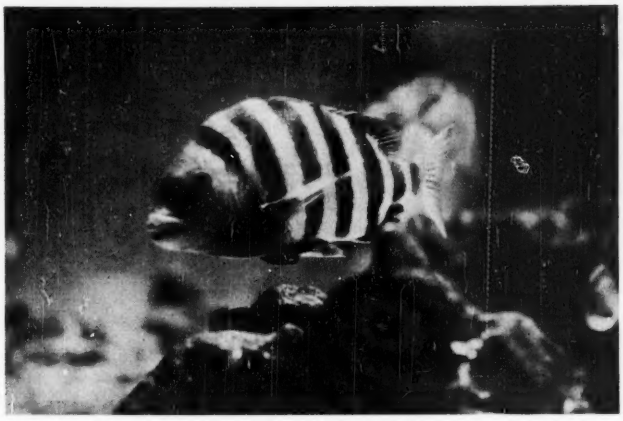
In order to do aquarium photography one must, of course, have access to an aquarium. That, in itself, is no simple matter since aquaria are much scarcer than either museums or zoos. There is the Shedd Aquarium in Chicago and there used to be one on the Battery in New York. There are some small ones along the Pacific coast and some along the Atlantic. There is a small but rather interesting municipal aquarium at Key West, Florida, open to the sky and readily suitable for photography. The Key West aquarium, I have been told, is one of the few (if not the only) aquaria where coral will grow in captivity.

But the aquarium that is really the answer to a fish-photographer's wildest dreams is located a few miles south of St. Augustine, Florida. It is Marine Studios at Marineland, a trio of large, open-to-the-sky, salt-water tanks, where one can see and photograph almost every variety of sea life to be found in the Atlantic, whose blue breakers roll against the white sand beach close by.

There one can see big fish and little fish, bright fish and dull fish, fish that eat other fish, and fish that do not. One can see eels and starfishes, sea urchins and sponges, sea anemones and barnacles, giant turtles and rays, crayfish, crabs, an occasional octopus — and fish, fish, fish.

The tanks at Marine Studios are arranged with portholes at different levels, so the photographer can focus on sea life on the bottom, half way up, and at the surface. Light penetrates readily, green-gold at first, and growing dimmer and bluer as the depth of water increases. But, even at the bottom, it is sufficient for both black-and-white and color photography. Exposures must be longer, of course, and the subjects must be obligingly motionless for a sufficient time as the light decreases. For that reason, a special outdoor tank filled with gay-colored reef inhabitants like butterfly fish, sergeant-majors, various-hued angel fish, squirrel and parrot fish, beau gregories and the like, is a special boon for the color photographer.

It is best, I think, to use a camera with a groundglass focusing device, for then one can see his subject. Water is a deceptive medium and distant objects readi-



This sheepshead swam into position to have its picture taken. The camera was focused on these particular rocks and the exposure was made when a subject appeared. Note that the focus is sharpest on the center of the body, rather than on the head.

ly discernible to the eye frequently fail to record successfully on film. For best results, do not try to photograph subjects further than two or three feet from the camera. As for speed, the camera will not stop a fish in water as easily as a bird in air. The light is not the same and the water itself provides too much resistance. If the fish are darting rapidly by, let them go. You cannot stop them, so do not waste film.

Study the situation before taking a picture. View the scene from different levels. Note where the fish are congregated, where they are on the move and where they are loafing. Before long you will recognize individuals — dozing or resting with scarcely the flick of a fin. They are your most obliging subjects.

Watch the others, especially the larger individuals. You will soon see that many of them have a regular orbit as they circle the tank. Note their speed and the distance at which they pass your window. After several go-rounds you will know where to focus and you can get them easily as they pass.

Do not try to guess at the light; make use of your exposure meter. Light under water is deceiving. The exposure meter will tell you what speed and lens stop will give best results. Depend on that (assuming, of course, that the meter is dependable) and do as it indicates.

Movie cameras can be used as readily as still cameras in aquarium photography. The same principles of speed, exposure, and, beyond all else, of holding the camera steady, apply. Fish make excellent, unconcerned, and entertaining actors.

Not every picture you take will be a masterpiece. You may find that the fish you counted on to remain motionless suddenly decided to dart away just as you clicked the shutter, or that the details your eye detected were not recorded so well by the camera. None-the-less, if you take enough pictures, some of them are bound to be highly gratifying.

Thus far I have mentioned only the underwater aspects of photography at Marine Studios. There are many opportunities at the surface, too, especially when the porpoises are being fed. This occurs several times daily and is one of the features of the institution. Porpoises, of course, are mammals, not fish. From the entertainment standpoint, they are perfect "hams" and they seem to enjoy showing off as well as the two-legged, land-going mammals enjoy watching them.

When feeding time approaches, the porpoises seem to sense it. They break water oftener, stay closer to the surface, and in general congregate under the platform from which they are fed. When the attendant appears and holds a fish out over the water, one, two, three, or even more porpoises will spring out of the water, the lucky one grabbing the toothsome tidbit before he drops back into the water again. Sometimes the sleek gray creatures spring completely out of the water, no mean feat for an animal measuring three or more feet from the tip of its bottle-shaped nose to the cleft in its broad, horizontally flattened tail.

Marine Studios has a special place reserved for professional photographers, from which the cameraman can operate at close range and without interference. The amateur can, or he need not, move into this space. I prefer a position about a quarter of the way around the circular tank from the feeding platform, the side chosen depending on the direction of the light (morning or afternoon). A lens stop of f/8 or more (again depending on light) assures greater detail. A shutter speed of from 1/500 up will stop the porpoise in

(Continued on page 163)

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IRISH FURZE IN OREGON

(Continued from page 130)

operations. A strong wind sent it out of control and eventually it reached the Bandon area. What had been a minor forest fire became a raging holocaust. In no time at all the entire business section of Bandon, with the exception of a single building, was wiped out. A dozen people lost their lives, others were driven into the sea in order to save themselves. And when it was all over, the resort town, known as the most beautiful in southern Oregon, was a blackened rubble with only a few chimneys marking the site of summer homes.

NATURE PHOTOGRAPHY FOR MY SAKE

(Continued from page 134)

solved or an opportunity to be grasped; then ideas, a plan, partial or complete; and usually an amazingly effective solution, fitting the plant or creature to survive.

The Nature photographer need not be a scientist struggling to discover how helpful variations occur or adaptations are induced; or a philosopher raising ultimate questions of universal design, to enjoy finding and recording these examples of the fitness of things.

Many interesting ones will be found among the birds, whose perfect adaptations we may choose as a sort of general symbol of purpose or design in Nature. From their nearly hollow, airlight skeletons, which may be photographed in museums; to their extraordinary covering of feathers, fit objects for the macroscopic fan, they reveal fitness for their ways of life. The greatest fun, however, comes from photographing the bird in its favorite haunts, using its special equipment of wings and tail, feet and legs, eye and beak to meet the seasonal needs of itself or young. The rose-breasted grosbeak cracking sunflower seeds with its horny bill; the brown thrasher, with slender, curving beak, seeking insects in the thicket; the barn swallows sailing over the meadows, or the herring gulls over the waves, each on tireless wings; the long-legged, wading American egret fishing for frogs in the marsh; the web-footed, quilted Canada goose paddling contentedly down a wintry stream; the red-shouldered hawk dive-bombing a field mouse spied by almost telescopic vision from a thousand feet above the grass roots and captured in terrible, vise-like talons; the osprey, braking with fanned tail and slithering wings for a landing on the nest—all of them are like so many skilled craftsmen earning their living by using their tools with utmost precision. What though the wait in the blind be hours, the splash through the marsh exhausting, the trudge by the shore long, if the hunt ends in my bagging with lens, shutter, and film perfect design in purposive action. Let the judges vote green or red, I have had *my* fun!

Man, having appeared in the cosmos, is a part of Nature; and the universe will never be fully appreciated until we include all of human personality in our interpretation of it. However, when I speak of Personality as one facet of Nature that her cameraman is challenged to record, I shall refer only to those rudimentary foregleams of intellectual and moral life that we call instinct, plus adaptability to circumstances, and capacity for learning by experience.

Examples for photography are legion. What does instinct direct a creature to do? A fascinating answer may be given in a series on the life history of almost any insect, say the Promethea moth. Cocoons may be gathered in autumn on spicebush, alder or wild cherry. Keep them cool over winter. By middle May, given lucky timing, photograph the moths emerging, filling out their wings, and the first adult movements. Then go to the mating, the laying of eggs, hatching of young larvae, their feeding on the host plant, growth through successive molts, and so to the spinning of new cocoons. Instinct? Yes, but aiming toward intelligence. All of this will require close-up equipment, infinite pains with detail, angle of view, backgrounds and lighting, and may be done indoors under lights, or in the field.

A bird series may start at a windowsill feeding counter in winter, or a bird bath or box in summer. What species can be photographed adapting itself to other than native food, bathing facilities, nesting materials or sites? Among others are the insect-eating nuthatch pecking at suet, the flicker bathing, the Baltimore oriole taking lengths of colored worsted, the bluebird occupying a box. Do all song sparrows, catbirds, or any selected species choose similar locations, materials, building processes? How do egg clutches, incubation, and care of young vary? What about bird emotions? As camera work proceeds at the nest, can fear, parental concern, pugnacity, courage, playfulness, or growing confidence be recorded?

Patiently applied techniques, imagination, fellow feeling, and the lucky "breaks," I find, add pictures year by year that reveal glimpses of upreaching personality among our sub-human neighbors, the very seeing and recording of which bring their own rewards.

Finally, Nature reveals Community. Here again, the social instincts and behavior of greatest significance for understanding the whole scheme of things are human; but the Nature photographer will find more than he can handle in the lower orders.

Everywhere interdependence and co-operation, the essentials of community, meet the eye, challenge the imagination to understand, and the camera to record. The earth, derived materially from the sun, depends upon it for heat, light, and other radiations, which alone make life and growth possible, thus dramatizing with hidden meaning every hour from sunrise to sunset, and every condition of the weather. The great orders rest upon one another; the mineral upon the atomic; the vegetable upon the mineral; the animal upon the vegetable; with many complicated relationships within each order. Plants and animals, in sea, land and air, establish colonies and mutually sustaining endeavors. Parasitic relations occur, leading to short or long food chains, each with its final dominant carnivore, man topping them all. Generation depends upon generation, establishing the family. Seasonal or continual flocking and herding express the deepest social needs and advantages. Areas come into rather long-term balance describable as shore, marsh, lake, field, woodland, mountain, or desert "communities," each with its dominant forms selected in the severe contest for survival. And all, at last, compose what naturalists have called the "balance of Nature," the organized whole in which each part is given both opportunity and boundary.

Here picture possibilities are enormous. A lifetime could be spent in recording the relationships of any one of the "communities" suggested by, say, a New England woodland. What species of mineral, plant, and animal are present? Which supports or co-operates with what other? Which are dominant? What are their life histories? What insects are visiting the flowers; what birds are feeding on the insects; what animals are nourished by the plants or lower animals? How do the changing seasons affect "community" life?

One tiny detail for me symbolizes all — a bee visiting clover. I have lain in lush pasture with camera ready at a likely blossom. Sun, rain, and soil have set the stage. After milleniums of evolution, the plant, equipped for bi-sexual reproduction, but dependent upon the bee to work the mechanism, and the insect, dependent upon the clover for its food and future, are brought together this day in this pasture. Each gives and takes with a chain reaction which in one direction enriches the soil with humus and fixed nitrogen, and in the other gives seed to the clover, and sustenance to beast and man. Then, suddenly, as I click the shutter on a bee visiting clover, there sweeps over me the sense of far wider Community, ranging from electronic activity within the sun to worship within the cathedral where human minds and hearts, using energies supplied by the lower orders, strive for one world of brotherhood and peace. What matter whether the picture be art, so long as I have had the vision, as did Wordsworth, of color?

> A presence which disturbs me with the joy
> Of elevated thoughts; a sense sublime
> Of something far more deeply interfused,
> Whose dwelling is the light of setting suns,
> And the round ocean and the living air,
> And the blue sky, and in the mind of man,

CAMERA TRAILS

(Continued from page 161)

midair.

It is hard to judge just when to shoot. The highest point in the jump is the most spectacular, of course, and if it is possible to catch several porpoises at a time, so much the better. But chance plays a major role here, one never knows beforehand how many will jump, or how high. Watch for a few times until you get the hang of it, and then take a number of pictures. Some will be better than others, but from the total you can pick the best.

Movies, of course, are spectacular. For still pictures, I think black-and-white film is best because it is faster. "Still" color film is so slow that the results from fast action are not particularly good.

So much for now, and for aquarium photography. Next month I will write about taking pictures of the occupants of the fish bowl at home. Trade notes and equipment data will be postponed until next month, also.

TO GAD OR NOT TO GAD

(Continued from page 155)

boats; others are arranged in clusters with a highly organized community life.

Be it large or small, a jellyfish is a voracious eater that works all the time at the job of getting food. As it moves through the water the tentacles surrounding the mouth trail behind it. These seize food particles in the water and sweep them into the mouth of the jellyfish, which is in the center on the under side of the body.

The tentacles also protect the jellyfish from harm. They lash about and ward off enemies that threaten. As many of us have learned from bitter experience, the stinging cells on the ends of the tentacles of a large jellyfish can give us a nasty sting. The stinging cells on a colorless jellyfish rarely irritate human skin, but those on the yellow, orange, or blue animals cause pain similar to that of a roadside nettle.

Because of the barbed, poisonous tentacles, a jellyfish is often called a medusa. Medusa, we remember, was a dragon-like woman in Greek mythology whose hair was a mass of writhing, twisting serpents. The similarity comes from the fact that the tentacles on the jellyfish work havoc as Medusa's serpent-like tresses did.

In order that the jellyfish can find its way about at night, it carries an electric light system with it. Sometimes thousands of these little light bearers travel through the water like a torch-light procession, causing the waves to look as though they were touched with fire. Plankton produces light, too, and it seems to be the job of the jellyfish and the plankton to furnish electric power for the seashore dwellers. We human beings have not figured out just how the light is produced in seashore animals, but some curious scientist will solve this problem sooner or later.

It is a contrary world. The jellyfish, which has no place to lay its head, longs for rest and quiet, while the hydroid, which is forced to live in solitary confinement, may dream of travel and gaiety. Man or lower animal, we are never satisfied.

GALAXIES IN CANCER

(Continued from page 157)

times but occur earlier in successive years and always at the time when the moon is at or near one of its nodes, the two points where it crosses the earth's orbit. There will be another eclipse of the sun in September when the moon will again be at one of its nodes. The next eclipse will be of special interest to those in the mid-Atlantic states as the path of the annular phase starts in North Carolina and Virginia.

At the beginning of March Mercury will be in the morning sky and not well placed for observation, as it is low in the east at sunrise and gradually drawing in toward the sun. It will be in superior conjunction with the sun on March 11, when it will have the phase of the full moon, but will be invisible as it will be in line with sun and earth, with the sun between the earth and Mercury. It will then pass into the evening sky and may be seen to advantage the last few days in March, as it will be at a favorable eastern elongation early in April. It should then be more brilliant than Vega and clearly visible in the evening twilight nearly due west.

Venus is improving its position in the evening sky as it increases its distance from the sun, and this planet is at a higher altitude above the western horizon at sunset on each successive night. Mars is in the constellation of Pisces this month, low in the western sky at sunset. It is on the far side of its orbit from the earth at a distance of about 220,000,000 miles. It will be at its greatest distance from the earth late in June, when it will be about 16,000,000 miles more distant from the earth than it is now. Mars and Mercury will be in conjunction on March 26, when Mercury will be about 1½ degrees north of Mars. Jupiter will be in conjunction with the sun on March 11, when it will pass to the morning sky. It will be too close to the sun to be seen this month. Saturn will be in opposition to the sun on March 20, when it will be visible throughout the night, rising in the east at sunset. It is now in Virgo, some degrees to the northwest of Spica, and is moving from east to west, or retrograding. It is brighter than Spica and yellowish in color.

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ANNUAL MEETING

THREE days of well-attended, stimulating sessions of the American Nature Study Society and related science-teaching organizations were topped off during the December holidays by an invigorating hike through two of Cleveland's forested metropolitan parks.

Hundreds of nature and conservation leaders, teachers, hobbyists, writers, etc., attended the meetings at the Hotel Statler and at Cleveland's Municipal Auditorium. These sessions were one of the important features of the annual Christmas week meeting of the American Association for the Advancement of Science.

The program had been carefully arranged by a joint committee representing the American Nature Study Society, the National Association of Biology Teachers, and the National Science Teachers Association. Several joint sessions between two societies took up subjects of common interest, while other sessions included all three.

Cleveland's Superintendent of Schools, Dr. Mark C. Shinnerer, greeted all the Societies in the joint opening session. He urged that science teachers, in *addition* to continuing to do a good job of teaching science, "must help meet four other basic needs of our day."

1. Provide and support intelligent leadership.

2. Train for individual responsibility.

3. Teach the need for vigilant, informed honesty.

4. Develop an earnest and ardent loyalty.

"Your students have a rendezvous with the future. It must be a rendezvous with freedom. Flavored with these basic needs, science will make that possible. But science without freedom will not give us a life worth the living."

Two streamlined busses whisked the field trip party first to the Brecksville Reserve. Here a visit to the fine trailside museum was sandwiched between short exploratory trips. About six inches of powdery snow covered the ground. Roger Tory Peterson, and museum naturalist Harold Wallin led the field groups. The party then journeyed to Chagrin Reservation. A luncheon was held in the remarkably attractive and spacious Science Lodge. Dr. Ellis Persing, past president of the ANSS, and Professor at Western Reserve University, was host, assisted by Ruth Hubbard, Cleveland Heights Science Supervisor, and a large committee of teachers. The afternoon field trip gave everyone an opportunity to inspect two projects of the science teachers — an Evergreen Arboretum and a Nature Trail — as well as to see wintering birds on the Reservation.

The election of officers, announced at the Annual Meeting, brings in an entirely new slate: President, Ellsworth Jaeger of the Buffalo Museum of Science; Vice-President, Roger Tory Peterson; Secretary, E. T. Boardman, Rochester Museum; and Treasurer, H. Raymond Gregg, National Capitol Parks, Washington. New directors, elected for two-year terms, are Eva Gordon, Charles E. Mohr, Edwin Way Teale, Richard L. Weaver, retiring Secretary-Treasurer, and Richard W. Westwood, retiring President. Mrs. Hazel Fink of Elmsford, N. Y., was chosen to continue editing the quarterly ANSS NEWS LETTER, and E. Laurence Palmer was re-elected AAAS Representative.

The opening, joint session of the three societies was devoted to a symposium on "Outdoor Resources for Learning Science." Panel members Joe Craw, Ruth Hubbard, Richard L. Weaver, and Julian Smith, reported many significant developments, particularly in school camping in the mid-West and Southeast. Director of *Life Camps*, L. B. Sharp, presided over the discussion.

A demonstration of "Techniques in Conservation Teaching" by five Cleveland Teachers, led by Grace Maddux, was the feature of the second day's meeting.

"Caves as a Tool in Nature Education" was presented by Charles E. Mohr, and illustrated with a series of remarkable kodachrome slides. "Meeting Amphibians and Reptiles" by James A. Fowler, likewise demonstrated ways of enriching nature programs for school and club, as well as for the individual hobbyist.

Using copies of the *Cornell Rural School Leaflet*, which were distributed to everyone in the audience, E. Laurence Palmer, conducted a stimulating discussion on "Using Outdoor Resources in Winter." His supplementary list of "Things to Do in Winter" was an eye-opener even to experienced teachers.

The meeting was climaxed by the presentation by Mrs. Warner Seely of three of her prize-winning, one-reel color films on familiar Ohio birds.

The Annual Banquet of the ANSS was highlighted by Arthur A. Allen's colorful lecture and film, "The Curlew's Nest," the story of his successful quest for the nest of the bristle-thighed curlew. Toastmaster Warner Seely's humorous anecdotes about society leaders greatly enlivened the affair.

The Annual Business Meeting was followed by the showing of films and slides on the Audubon Camp of Connecticut, the Iowa Conservation Camp, and the Greenbrook Sanctuary, New Jersey. Dr. Palmer showed a series of outstanding kodachromes as he reported on his recent trip to New Zealand, and Ruth Hopson presented another series of beautiful western scenes in natural color.

The next meeting of the ANSS will be held in Philadelphia next Christmas week, in connection with the meetings of the American Association for the Advancement of Science. Chairman of local arrangements will be James A. Fowler, Director of Education at the Academy of Natural Sciences.

THE PASTURE

(Continued from page 151)

told the incident herself. "As that red-eyed critter was coming at me, I felt numb, and then I remembered Aunt Pamela and the panther. I never let go of my berry pail but just sat there and looked that bull right square in the eye. He stopped a little ways off and finally went to hooking into a tree. As soon as his tail was my way, I moseyed over toward the fence. And was I ever thankful to be on the other side!"

"Fear is Satan," comes down the pasture wind.

Stretched on the grass at the edge of the brook, his fishing pole beside him, one Sunday afternoon in 1862, Grandfather drew his notebook from his pocket and wrote for his lyceum paper — a paper to bring fortitude to his neighbors, whose faith was being undermined by the War of the Rebellion and by Darwin's *Origin of Species*; a fortitude born of his own long pondering as he had tramped cow-path, line fence and wood road throughout his boyhood and youth.

"Considering the facts as Nature presents them to our minds, we at once conceive that before any of the animal kingdom were created from the dark mass of inertia to active life, the herb, the grasses, the shrubs and fruit must have been a production of the earth. Hence the herbivorous animal must have been the first created according to Nature's Book. After so much of creation had been perfected, the carnivorous animal could have an appropriate sphere of action, and Nature would point to the fact of its creation. So that creation must have progressed step by step through a long period of time, whether we denominate that period to be six days of common time or six periods of time of indefinite length. So that the creation of one thing was made to follow another, all in perfect order and in their appropriate time and place, never conflicting with the purpose for which they were created.

"So far as the *Bible* speaks about the order of creation, it does not conflict, but harmonizes, with the Book of Nature in every respect except that the *Bible* says God created all these things, while that of Nature declares that it was done and leaves the pupil to draw his own inference in respect to the creating power. Yet who can turn one leaf after another in Nature's Book without discovering the infinite power and wisdom of an Infinite God?"

Each dawn still turns the pasture pages for any who will pause to read.

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A place where members of the American Nature Association and readers of Nature Magazine may find many interesting offerings or may advertise themselves, at low cost, for things wanted; things they have for Sale, for Trade, for Sale or Trade. This is an excellent forum for acquiring or disposing of such items as binoculars, books, cameras and photographic equipment, magazines, sports and outdoor equipment, etc

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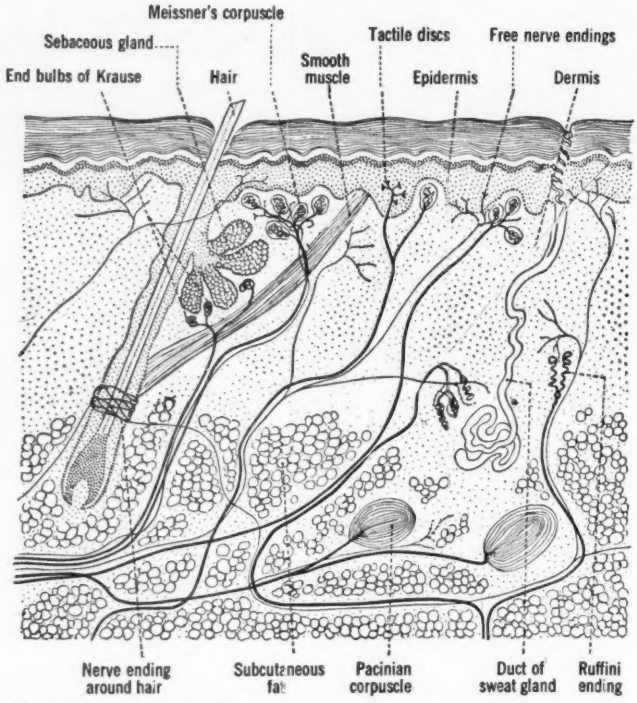
UNDER THE MICROSCOPE

By JULIAN D. CORRINGTON

INFORMATION, PLEASE!

THE many ways in which we acquire our information of the world around us constitutes an amazing and interesting chapter in neurology, the science of the nervous system. An essential picture to keep in mind in this study is the situation of the brain and spinal cord. Completely immured by bone and membranes, shrouded in darkness and silence, maintained at a constant temperature, these nervous organs are like the operator of a telephone switchboard, cooped up in some small chamber, yet always in touch with the outside through thousands of wires, carrying messages both to and fro.

The nervous system as a whole is divided into three main parts for convenience of reference, although all function together as a single concern in the living body. These are the central, peripheral, and autonomic nervous systems. The *central* comprises those axial and deeply buried structures, the brain and spinal cord; the *peripheral* consists of the cranial nerves of the brain and spinal nerves of the cord, connecting the central nervous system with the exterior and to the many organs of the body; the *autonomic* (formerly sympathetic) is that elaborate system attending to visceral and involuntary functions.



Schematic representation of the nerve supply of skin. Not all of the endings shown are to be found in any one skin area. The heavy lines are myelinated fibers, the light lines nonmyelinated fibres. (Reproduced from "Fundamental of Neurology" by Gardner, as modified after Woolard. Courtesy W. B. Saunders Company.)

Nerve cells as units of these systems were introduced in the April, 1944, issue, where it was pointed out that a single nerve cell or *neuron* has a large cell body containing the nucleus, and one or more processes, often extremely long, which are the nerve fibers. Bundles of fibers running together within a common sheath make a nerve.

Each neuron has at least one incoming fiber, the *dendrite*, and one outgoing, the *axon*. Bipolar nerve cells have one of each; multipolar cells have many dendrites, but only one axon. Bipolar neurons are sensory cells and remain in the two-pole condition, regarded as primitive, only in certain organs, as the nose, eye, and ear. In the cranial and spinal ganglia, where most sensory cells are located, the cell body withdraws to one side of its two processes during development, with the result that these two become fused side-by-side for a short distance, making this neuron descriptively unipolar.

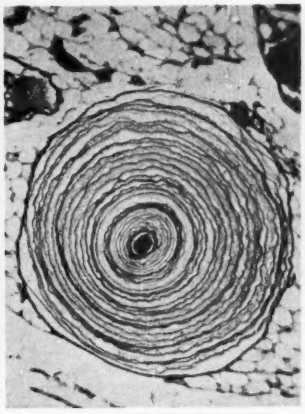
On a basis of direction of impulse, two kinds of neurons, fibers, or nerves are *sensory* and *motor*. The former carry information from the outside, or from other parts of the body, to the central nervous system. The latter carry messages outward, operating either muscles or glands. Functionally, the first link in the chain of obtaining and acting upon intelligence is the sensory nerve ending, which constitutes the *receptor*. This is the terminus of the dendrite of a unipolar or bipolar neuron, or, in the case of hearing and taste, of neuroepithelial cells in connection with such terminations. Afferent or sensory neurons carry impulses generated by appropriate stimuli in to the central nervous system, where suitable responses may result, impulses then traveling outward over efferent or motor neurons to an *effector*, which is muscular tissue or a gland. Receptors are divided according to source of stimulus: *exteroceptive endings* receive stimuli that result from changes of the external environment, as touch; *interoceptive endings* are affected by changes in the internal surroundings, as visceral pain; and *proprioceptive endings*, located in muscles, tendons, and joints, give information as to tension and position.

Each different kind of stimulus affects a separate and specialized variety of nerve ending. Instead of just the classic five special senses we learned in school — vision, hearing, smell, taste, and touch — the neurologist now recognizes five special senses — vision, hearing, smell, taste, and balance, and a number of others called general senses. These include touch, pain, heat, cold, and pressure in the skin and subcutaneous tissues (exteroceptive); tension of muscles and tendons and position of joints and limbs (proprioceptive); and pain and pressure in the viscera (interoceptive). Vision and hearing are special cases of exteroception, smell and taste of interoception, and equilibrium or balance of proprioception. Vision, hearing, and smell are commonly said to differ from other senses in that they receive stimuli originating at a distance, but it must be remembered that something physical must travel from the object to the receptor, as photons, sound waves, or diffusing molecules.

Studies of the retina of the eye and cochlea of the ear are separate histological chapters, connected with complete surveys of the eye and ear as major organs, but the other receptors are usually studied together by observing suitable sections of the olfactory epithelium of the nose, taste buds from the tongue, and various special bodies in the skin.

The specialized cells receiving stimuli that the brain interprets, as smell, are *chemoreceptors*. They are bipolar neurons (*olfactory cells*), lying among non-nervous *sustentacular* (supporting) *cells* in the olfactory epithelium, a fairly thick sheet covering the upper third of the nasal

Meissner's corpuscle, human fingertip. 700 X.



Pancinian corpuscle, cross section, 125 X. Ward's slide.

region. Gland cells produce a secretion that coats this nasal mucous membrane, and in which molecules of diffusing substances dissolve in order to affect the smell receptors. Just how they do so is unknown, but unbelievably minute amounts and fine shades of differences are readily detected. Most of what is usually thought to be taste is actually smell.

The surfaces of the tongue and nearby areas of throat, epiglottis, and larynx are covered with a stratified epithelium containing *taste buds* at certain places. These extend from top to bottom of the epithelial layer and have the shape of a watermelon. Within each taste bud are cells long enough to pass from one end to the other, resembling the segments of an orange, the *supportive cells*, while sandwiched between these are a smaller number of thinner *gustatory cells*. In the accompanying photomicrograph, parts of six taste buds are shown, three on each side of a trench separating two papillae of the surface of the tongue. The very light one displays four gustatory cells at its center, characterized by elongate, oval nuclei; the fainter, larger, and rounder nuclei outside these four belong to supportive cells. This same taste bud also shows the *taste pore*, at the surface, seen to better advantage however in the dark taste bud next below. Into the *pore canal* leading inward from this opening project hair-like processes from the gustatory cells, supposed to be the means of detection of taste by these chemoreceptors. Some think the supportive cells may also play a part in this complex performance.

The gustatory cells are not nerve cells proper, but are designated as *neuroepithelial cells*; epithelial in that they form a part of this layer, neural in that they are specialized as receptors and not merely epithelial as are the supportive cells. The actual nerve endings are those of bipolar neurons that branch and ramify over the gustatory cells, and whose cell bodies are located in ganglia of any of three cranial nerves. From the anterior two-thirds of the tongue, the afferent fibers constitute a part of the facial nerve; from the posterior one-third and nearby throat walls, the fibers are a part of the glossopharyngeal; while those dendrites leaving the rest of the pharynx and larynx travel over the vagus. It is believed that any one receptor is sensitive to but one primary component of taste — sweet, sour, salty, bitter, and possibly others; most tastes being compounded out of these and modified by smell. The substance to be tasted must be dissolved in the saliva, in the same way that smell is perceived only after solutions are formed. If the tongue is dried experimentally, using a drug that will inhibit secretion, the subject cannot taste a dry substance, as salt or sugar, and everyone has had the experience of how a heavy cold, by blocking off smell, makes all food "tasteless," or "everything tastes the same," or "tastes like straw."

While the epithelia of nose and tongue are interesting in showing these specialized receptors, they are dwarfed in this regard by the skin. Here occur many types of sensory nerve endings, as reference to the diagram will show. Nerve fibers may terminate without any enlargement of special form, a condition designated as *free nerve endings*, thought to be the receptors of pain. Some are in the epidermis, others in the dermis or deeper and thicker portion of the skin, still others lie in the connective tissues around muscles, tendons, and joints, and elsewhere below the skin.

Touch or *tactile* or *Meissner's corpuscles* are relatively large oval bodies lying in elevations (papillae) of connective tissues of the dermis that push up into the overlying epidermis like fingers. One or more nerve fibers enter a papilla from below and branch and spiral around a number of modified and horizontal connective tissue cells. These corpuscles are distributed

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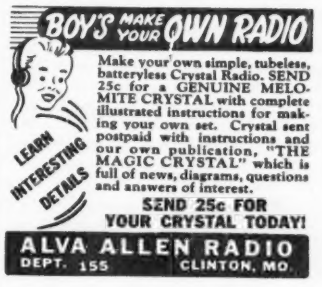
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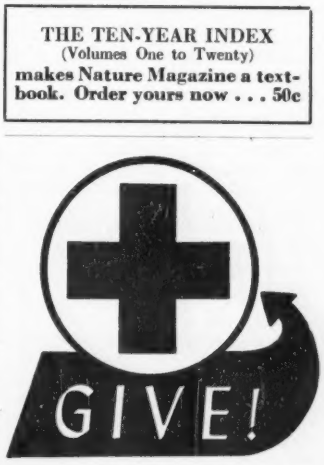


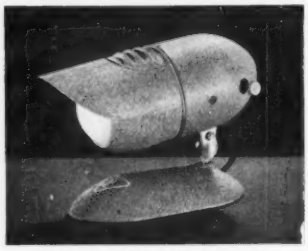
Taste buds, foliate papilla, rabbit tongue, 700X.

generally in the skin but occur principally in the thick skin of palms and soles, particularly in the fingertips and most especially in that of the forefinger. Collectively they constitute the organ of touch. They are notoriously difficult to demonstrate, in that the nervous elements do not show up with such routine stains as tint the connective tissue corpuscle, while the latter is left colorless with specific nerve techniques. Most catalogs do not list this slide preparation, and technicians generally prefer to take the afternoon off and go fishing if somone suggests making sections to show tactile corpuscles. The specimen here illustrated is one of the best we have seen made with the ordinary hematoxylin and eosin procedure.

Other nerve endings that are receptors of touch are shown in the drawing. A very effective type is the terminal network of a nerve fiber surrounding the base of a hair; we are immediately aware of the stimulus if even a single hair is touched, as when an insect crawls over the skin of the arm. There are also *tactile discs* (*tactile menisci, Merkel's discs*) located in the deeper layers of the epidermis and upon the sheaths of tactile hairs (vibrissae) of those mammals, as the cat, in which these are well developed.

Heat and cold are detected by separate endings, although their identity has not been established with certainty. *Bulbous corpuscles* or *end bulbs of Krause* are supposed to interpret cold, while *Ruffini endings* (*corpuscles of Ruffini, terminal cylinders*), complex and elongate affairs, are thought to be heat receptors. Others are designated as genital, cylindrical, or articular corpuscles.

A final type of receptor is the *lamellar* or *Pacinian corpuscle*, one of the most beautiful of microscopic objects, and the organ that records pressure. These are situated in the subcutaneous tissues generally, in the membranes surrounding bones, joints, and muscles, large blood vessels and nerves, and mesenteries. Commonly they appear in sections of the pancreas. These corpuscles are large enough to be seen macroscopically, up to 4 mm in length, and are shaped like a watermelon. Stained whole mounts may be made of those in mesenteries, the internal construction showing fairly well since they are semi-transparent. Median longisections reveal an axial core or inner-bulb that is the actual nerve fiber ending, surrounded by a large number of concentric layers (lamellae) of connective tissue fibers and cells that are invariably likened to the layers of an onion. Between layers is fluid, transmitting any external pressure to the dendrite of the core. The accompanying illustration shows a cross section of one of these bodies, named after Filippo Pacini, an Italian neurologist.



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NEW MICROSCOPE LAMP

THE Micro-Lite is a new Bausch & Lomb product that has many attractive features. For one thing, the price is $7.50; for another, the lamp used is an ordinary 40-watt bulb, so that the trouble of obtaining special bulbs is eliminated. The condensing lens is a bull's-eye with one surface ground to provide diffusion, and above this is an anti-glare shield to protect the operator's eyes. The base is heavy enough to prevent tipping and has four felt-padded feet to protect furniture. The whole lamp weighs just over two pounds, and is 8⅛ x 3⅛ in. in size, with 6½ ft. of cord, ready to plug in the ordinary house circuit. Louvers top and bottom keep down the temperature, the ball and socket joint enables adjustment for direction, and the switch is built in. The finish is gray crackle.

REVIEWS

Histology

PREVIOUSLY in these columns we have commented on the tendency for texts on standard subjects to become more and more elaborate until finally they are out of all reason in size and cost for a one-semester course. Every so often, some authors succeed in reversing the process and simplifying, as a sort of fresh start. This has been done with great proficiency in the *Textbook of Histology* by the late Professor José F. Nonidez, long connected with Cornell and more recently at Georgia, and Dr. William F. Windle, Pennsylvania, who completed the volume.

For the most part the text sticks to straight histology, which is briefly but adequately treated, and omits all of those luxury sidelines that run up the footage in so many of the better-known older works, as phylogeny and development, physiology and pathology, comparison, etymology, pronounciation, definitions, and history of each structure. Instead, the student is encouraged to read further, especially in modern papers. The style is clear, terse, and to the point; the illustrations are gorgeous and generous, nearly all original and, more often than not, of typical sections rather than special preparations. Included in the Appendix is a highly useful catalog of motion picture films available in this field, but we found the Index inadequate. Pp. xiii, 456; figs. 287 (402 separate drawings or photomicrographs). McGraw-Hill Book Co., Inc., 330 W. 42d St., New York 18, 1949. $6.75.

THAT most difficult assignment, the explanation for the layman of main achievements in the world of modern science, has been tackled by William H. Crouse in *Understanding Science*, and a very creditable job he has done. Anyone who tries this inevitably commits errors of commission and omission and gives the impression that half-truths are whole ones — but even the most erudite and exhaustive treatises run into the same situation, for no one can write the entire story, and no truth is final. This book aims to explain all of the gadgetry of civilization in simple, non-technical language, greatly assisted by the marginal pen drawings of Jeanne Bendick. Here you will find the atom and the rocket dissected and exposed to the gaze of the avid reader; fire, heat, steam, sound and light are explained, along with movies, television, and phonographs; electricity and magnetism; radar and radio; automobile engines and turbines. The book is very well written and effective; just the thing for the youngster who is growing up in this complex era and for the older reader who missed some science chapters along the way, or who may wish to brush up. Pp. viii, 190; many illustrations. McGraw-Hill Book Co., Inc., 330 W. 42d St., New York 18, 1948. $2.75.

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